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**Bats of Jalisco, México**

*Larry C. Watkins, J. Knox Jones, Jr.,  
and Hugh H. Genoways*

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## Bats of Jalisco, México

*Larry C. Watkins, J. Knox Jones, Jr.,  
and Hugh H. Genoways*

The fauna and flora of the Mexican state of Jalisco have received the much deserved attention of a number of biologists in recent years. Nevertheless, few comprehensive accounts of the biota of this interesting and physiographically diverse area have been published. In the period from 1949 to 1969, field representatives of the Museum of Natural History at The University of Kansas collected vertebrates in Jalisco. Among the specimens obtained from the state, the mammalian fauna of which never has been treated as a unit previously, were approximately 3000 bats, which form the primary basis for this report. In addition to specimens housed in the museum at Kansas, a few bats from other collections also were studied; furthermore, citation is made in the accounts beyond to Jaliscan localities from which bats have been reported previously in the literature other than those localities from which we actually examined material.

The first published scientific account of chiropterans from Jalisco was by J. A. Allen (1889), who reported three species from the state. Since that time, some eight species or subspecies new to science have been described from Jalisco and a number of other publications dealing with bats have appeared. The chiropteran fauna of the state, as presently known, consists of 62 species belonging to 34 genera of seven families. Certain other species, most notably *Diclidurus virgo*, *Tadarida macrotis*, and *Tadarida aurispinosa*, likely will be found to occur in Jalisco with the advent of additional field work there.

### ENVIRONMENT OF JALISCO

*Climate.*—The varied topography of Jalisco is reflected in the diversity of climate, which is characterized by the absence of a cold winter and by pronounced wet (May-October) and dry (November-April) seasons over much of the state. The average annual rainfall varies from 500 to more than 1500 millimeters (Fig. 1—after Gutiérrez Vázquez, 1959). Depending on elevation, exposure, and other features, the vegetational zones correspond to varying amounts of precipitation, and range from grassland and arid shrubland to mesophytic forest.

*Physiography.*—Gutiérrez Vázquez (1959), McVaugh (1961), and Rzedowski and McVaugh (1966) have mapped the physiographic regions of Jalisco (see Fig. 2), demonstrating the diverse features found there. It is of note that both the Eje Volcanico Transversal and Sierra Madre del Sur occupy portions of the state. The four major physiographic provinces are: 1) *Canyon Region* of the north, an area drained by the Río Santiago and its affluents from the north and east, comprising a series of precipitous canyons alternating with upland ridges that rise 700 to 1500 meters above the rivers; 2) the relatively dry *Eastern Highlands* (western edge of the Mexican Plateau), which slope from northeast to southwest at ele-



variations varying from 2200 to 1600 meters; 3) the *Interior Basins*, a series of shallow lake basins lying at elevations from 1250 to 1600 meters, mostly south and west of Lake Chapala; and 4) the *Pacific Slope*, a heterogeneous, partly mountainous region, representing in a general way the area of confluence of the principal mountain chains of western México, in which elevations range from sea level up to 4330 meters.

Most of western and central Jalisco is drained by small rivers that empty into the Pacific Ocean, the most important of which are the Ameca and Armeria. Lakes of the Interior Basins function as reservoirs and catch-traps for rainfall.

*Vegetation.*—The vegetation of western México ranges from tangled tropical deciduous and subdeciduous forest to semiarid grasslands and cacti, on the one hand, and to pine and fir forests on mountain slopes on the other.

Rzedowski and McVaugh (1966) listed approximately 1400 species of vascular plants that are abundant in Jalisco or characteristic of the several vegetational types. The vascular flora as a whole is thought to include more than 6000 species. The floristic relationships of Jalisco are as yet poorly understood, but the flora includes a strong Mexican-Central American element, as well as a considerable number of endemic species and species characteristic of the transverse volcanic range and the Mexican Plateau.

Thirteen types of vegetation were recognized in Jalisco by Rzedowski and McVaugh (*op. cit.*), but vast areas, especially in the Canyon Region and along the Pacific Coast have not been sampled extensively, and much of the analysis of these and other remote areas was accomplished with the aid of aerial photographs. The most extensive of the vegetational types recognized by them were tropical subdeciduous forest, tropical deciduous forest, thorn forest, subtropical scrub, grassland, and pine-oak forest.

*Human influence.*—The influence of man on the natural vegetation is particularly accented in the heavily populated areas near Guadalajara and Lake Chapala. Man's impact is less noticeable in the northeast, northwest, and south, and least influential along the Pacific Coast, where population density is low.

Nomadic agriculture has been the major cause of disturbance to the native vegetation, but fire and overgrazing also have been carried to extremes in some areas. With the exception of certain areas near the Pacific Coast, few parts of Jalisco have escaped significant human disturbance. Mining operations have accounted for disruption in some areas.

## METHODS AND ACKNOWLEDGMENTS

Families, genera, and species of bats recorded in this report are arranged following Hall and Kelson (1959). Appropriate taxonomic changes have been made to conform with the literature that has appeared since their work was published. Remarks on natural history, if available, are recorded in each species account and taxonomic comments are included where appropriate.

Measurements are given in millimeters and, unless otherwise noted, are of adults. Weights are in grams. Cranial measurements are listed in some accounts; in all cases, greatest length of skull includes the incisors.

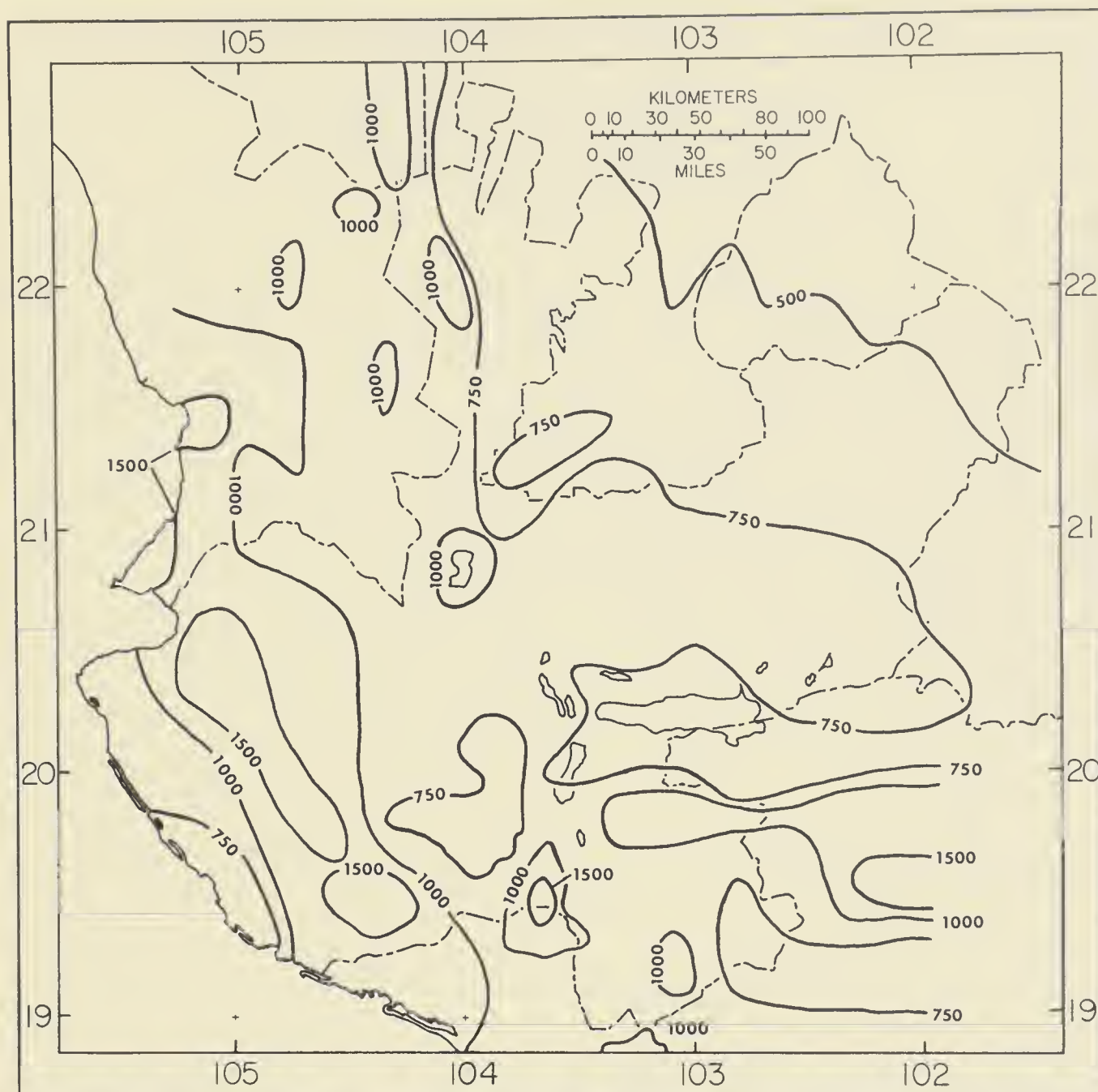


FIG. 1.—Annual rainfall (in millimeters) of Nueva Galicia, including Jalisco, Colima (directly to the south), Aguascalientes (to the northeast), and parts of Nayarit, Guanajuato, and Michoacán (from Rzedowski and McVaugh, 1966, after Gutiérrez Vázquez, 1959).

Localities from which specimens were examined and those representing additional records are arranged from north to south (west to east at same latitude) in accounts of taxa; place-names used in text are listed in the gazetteer and plotted on the accompanying map (Fig. 3). Elevation above sea level is provided for localities only when given by the original collector in his field notes or on specimen labels.

As noted, most specimens examined are in the collection of the Museum of Natural History at The University of Kansas and, unless otherwise indicated, catalogue numbers and specimens relate to that collection. Abbreviations identifying specimens studied from other collections are: ENCB—Escuela Nacional de Ciencias Biológicas, México, D. F. (Ticul Alvarez); UNAM—Instituto de



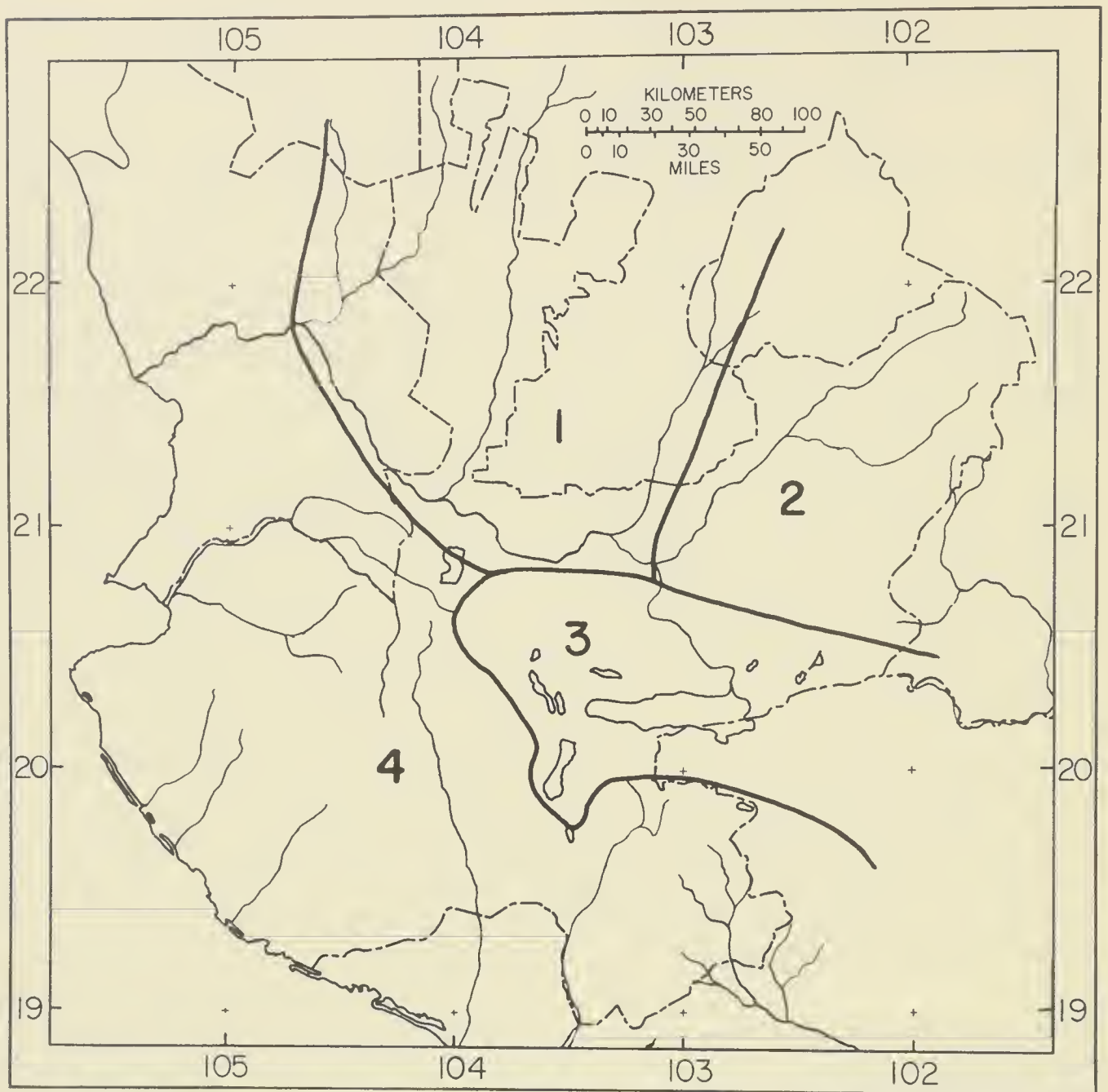


FIG. 2.—Physiographic regions and principal rivers of Jalisco (from Rzedowski and McVaugh, 1966, after Gutiérrez Vázquez, 1959). 1, Canyon Region; 2, Eastern Highlands; 3, Interior Basins; 4, Pacific Region.

Biología, Universidad Autónoma de México, México, D. F. (Bernardo Villa-R.); TTU—Texas Tech University (Robert J. Baker and Robert L. Packard); CU—Colorado State University (Bruce Wunder).

Most of the field work resulting in this report was financed by the Kansas University Endowment Association, by a contract (DA-49-193-MD-2215) from the Research and Development Command of the U. S. Army, or by the Committee on Systematics and Evolutionary Biology, The University of Kansas (with support from the National Science Foundation). Mr. and Mrs. Charles R. Bell provided some field expenses for Watkins. Others to whom we are especially indebted include J. R. Alcorn, David M. Armstrong, Elmer C. Birney, Craig C. Black, Percy L. Clifton, M. Raymond Lee, Mr. and Mrs. Lawrence O. Watkins, and Sherry Joan Watkins.



## ACCOUNTS OF SPECIES

Family EMBALLONURIDAE—Sac-winged Bats

***Saccopteryx bilineata centralis*** Thomas, 1904

Greater White-lined Bat

*Specimens examined* (14).—5 mi. NW Cuitzamala, 4; 2 mi. N Tenacatita, 25 ft., 8; 2 km. NNW Barro de Navidad, 2.

This white-lined bat may be restricted to dense deciduous forest in coastal areas of southwestern Jalisco. Save for brief mention in a paper on dental abnormalities (Phillips and Jones, 1969:512), the species has not been reported previously from the state, and our specimens represent the northernmost occurrence in western México. Two individuals were collected and another seen in a small cave in a cliff at a place 2 km. NNW Barro de Navidad; *Artibeus jamaicensis* and *Balantiopteryx plicata* also were taken in the cave. Specimens labeled with reference to Cuitzamala and Tenacatita were trapped in mist nets, which were stretched over a road through dense forest at the former locality and across a stream beneath overhanging branches at the latter. Other bats netted with *S. bilineata* at Tenacatita on 12 January or 7 February 1966 included: *Balantiopteryx plicata*, *Pteronotus personatus*, *Noctilio leporinus*, *Sturnira lilium*, *Artibeus jamaicensis*, *A. toltecus*, *Centurio senex*, *Rhogeessa parvula*, and *Molossus ater*.

Two females collected on 15 March evidenced no reproductive activity, but two of them taken on 14 April each carried a small embryo (crown-rump lengths 3 and 4).

Sanborn (1937) regarded *S. bilineata* as a monotypic species, but we tentatively follow Alvarez (1968:22-23) in recognizing *S. b. centralis* as a distinct subspecies. Specimens from México and northern Central America average considerably smaller than do those from South America (Sanborn, 1937:330; Husson, 1962:40). The variation, however, is clinal and final resolution of this problem must await study of series from throughout Middle America and adjacent northern South America.

Selected measurements of three males from Jalisco followed by the average and extremes of those for seven females are, respectively: length of forearm, 42.6, 43.8, 42.6, 46.0 (44.9-47.3); greatest length of skull, 16.0, 16.2, 16.0, 16.3 (16.0-16.6); condylobasal length, 13.4, 13.4, 13.4, 13.8 (13.4-14.0); zygomatic breadth, 9.8, 10.1, 10.0, 10.1 (10.0-10.3); interorbital constriction, 2.3, 2.5, 2.2, 2.3 (2.2-2.5); breadth of braincase, 7.5, 8.0, 8.0, 7.9 (7.7-8.0); length of maxillary toothrow, 6.2, 6.3, 6.1, 6.4 (6.2-6.7). Two males and four nonpregnant females weighed 6.9, 7.3, 8.1, 7.6, 7.5, and 7.0, respectively. One female from Jalisco (KU 105412) lacks the small, peglike, first upper premolar on both sides.

***Balantiopteryx plicata plicata*** Peters, 1867

Peter's Bat

*Specimens examined* (103).—2 mi. E Bolaños, 3550 ft., 6; 2 mi. ESE Plan de Barrancas, 6; 3 mi. N Tequila, 5; 1 mi. WNW Tequila, 2; 6 mi. N, 2 mi. E Atoyac, 4400 ft., 4;

6 mi. E Limón, 2700 ft., 33; 4 mi. N, 2½ mi. E Autlán, 21; Tolimán, 2200 ft., 11; 5 mi. NW Cuitzamala, 1; Cuitzamala, 25 ft., 6; 2 mi. N Tenacatita, 25 ft., 2; 2 km. NNW Barro de Navidad, 6.

This species is widely distributed in western Jalisco and evidently is common in many areas; easternmost records are from the vicinities of Bolaños, Tequila, Atoyac, and Tolimán. The known altitudinal range in the state is from sea level to 4400 feet. With the exception of a paper on dental abnormalities (Phillips and Jones, 1969:514-515), we know of no previously published records of this bat from Jalisco.

Some of our specimens were taken in mist nets (see account of *Saccopteryx bilineata*, for example), but others were collected from daytime roosts. Many were found, for example, in an abandoned mine 6 mi. E Limón along with *Desmodus rotundus* and *Glossophaga soricina*. Near Plan de Barrancas and at Cuitzamala, individuals were obtained from small caves, that at the former place being about 20 feet deep; at Tolimán, specimens were obtained in a tunnel along with representatives of *Desmodus rotundus*, *Glossophaga soricina*, and *Micronycteris megalotis*, and 2 mi. E Bolaños several were taken in a large cave inhabited also by six other kinds of bats (see account of *Macrotus waterhousii*).

Published information suggests that *B. plicata* breeds but once annually. Pregnant females from México have been reported for the months May through August (Cockrum, 1955:488), and Villa-R. (1967:157-158) noted a lactating female in September. In our material, one September-taken female was lactating, but females obtained in February, March, September, and October evidenced no reproductive activity.

A female (KU 87268) from Jalisco has a supernumerary premolar, resembling the normal first premolar, on the right side of the lower jaw.

#### Family NOCTILIONIDAE—Fish-eating Bats

#### **Noctilio leporinus mexicanus** Goldman, 1915

#### Big Fishing Bat

*Specimens examined* (9).—Cuitzamala, 25 ft., 3; 2 mi. N Tenacatita, 25 ft., 5; Playa Tenacatita, 1.

*Additional record*.—Bahia Chamela (Villa-R., 1967:163).

All specimens of *Noctilio* examined by us from Jalisco were captured along the Pacific Coast in mist nets placed over water. None is from an altitude greater than 25 feet. The northernmost record for the state is from Bahia Chamela, although this bat is known to occur in western México as far north as southern Sinaloa.

Three specimens from Cuitzamala were netted over a river bordered by dense vegetation; individuals of *Pteronotus personatus*, *Glossophaga soricina*, *Sturnira lilium*, *Artibeus lituratus*, and *Rhogeessa parvula* were taken in the same net. At a place 2 mi. N Tenacatita, *Noctilio* was netted over a river in association with nine other species of bats (see account of *Saccopteryx bilineata*) on 11-12 January and 7 February 1966. The specimen from Playa Tenacatita was netted late in the evening of 15 April 1966, over a lagoon that contained many fish.



Among our Jaliscoan specimens, a female from Playa Tenacatita, captured on 15 April, contained a single embryo (19 in crown-rump length) and another female from near Tenacatita was lactating when caught on 11 January. Three other females taken in January and February evinced no gross reproductive activity.

Family MORMOOPIDAE—Mustached and Naked-backed Bats

***Pteronotus personatus psilotis*** (Dobson, 1878)

Wagner's Mustached Bat

*Specimens examined* (39).—5 mi. S Grullo, 3100 ft., 3; Autlán de la Grana, 12 (UNAM); Cuitzamala, 7; 2 km. NW Emiliano Zapata, 20 m., 2; 2 mi. N Tenacatita, 25 ft., 14; Cihuatlán, 25 ft., 1.

This mustached bat is known in Jalisco only from the extreme southwestern part of the state and from the vicinity of Autlán and Grullo. All known record stations are in the tropical subdeciduous and deciduous forest zones as defined by Rzedowski and McVaugh (1966). Additional collecting in the lowlands and adjacent areas along the Pacific slope undoubtedly will produce more specimens, because this species is known from as far north as southern Sonora (Baker and Christianson, 1966: 310). Jaliscoan specimens have been taken at altitudes ranging from 25 to 3100 feet.

Information abstracted from field notes, describing conditions under which our specimens were captured, suggests that this bat frequents flyways (particularly watercourses) lined with dense vegetation. A partial list of species taken at the same localities as *P. personatus* is in the accounts of *Saccopteryx bilineata*, *Noctilio leporinus*, and *Choeroniscus godmani*.

There are few published data concerning the reproductive biology of *P. personatus*. None of 13 Jaliscoan females examined for reproductive activity (taken in the months of January, February, August, October, and December) was pregnant. An August-taken male had testes that measured 3.

We follow Smith (1972) in use of the specific name *personatus* for this bat, formerly known as *Pteronotus psilotis*.

***Pteronotus parnellii mexicanus*** (Miller, 1902)

Parnell's Mustached Bat

*Specimens examined* (66).—2 mi. E Bolaños, 3550 ft., 16; 2 mi. ESE Plan de Barrancas, 4; 1½ mi. WNW Amatitán, 4100 ft., 1; 2 mi. N Milpillas, 3000 ft., 2; 15 km. W Ameca, 4200 ft., 3; 10 mi. SE Talpa de Allende, 5350 ft., 1; 5 mi. W Chapala, 5000 ft., 14; ½ km. N, 3 km. W Jamay, 1650 m., 7 (ENCB); 2 mi. S La Cuesta, 1500 ft., 2; 6 mi. E Limón, 2700 ft., 3; 5 mi. S Grullo, 3100 ft., 3; 11 mi. SW Autlán, 2000 ft., 2; El Tabaco, 200 ft., 1; 10 mi. NNE Pihuamo, 3500 ft., 3; 15 km. NW Cihuatlán, 4.

*Additional records* (Villa-R., 1967:178, unless otherwise noted).—Bolaños (Smith, 1972:71); Ameca (Rehn, 1904a:204); El Zapote (Smith, 1972:71); 4 mi. SE Ocotlán (Smith, 1972:71); 7.5 km. W Jamay; La Grana, Autlán; Los Masos (J. A. Allen, 1906:261); Pihuamo.

Available Jaliscoan records of this bat indicate that it is widely distributed in the central and western parts of the state. The species evidently is absent from the



predominantly grassland areas of the northeast. Specimens have been taken at altitudes ranging from 200 to more than 5300 feet, but most of our specimens are from between 2500 and 4000 feet. Of the 15 localities from which these bats have been examined, 11 are places where streams or rivers were lined by dense forest. Another station, El Tabaco, was in a dense banana grove.

Two females taken early in May each carried a single embryo (18 and 19 in crown-rump length), one female taken on 14 May contained an embryo that measured 23, six females taken on 29 May each contained embryos (26, 27, 27, 28, 28, and 28), and two females captured on the night of 7-8 June carried embryos (23.5 and 24 in crown-rump length). Other females taken in June, July, September, and October evidenced no gross reproductive activity. Two November-taken males had testes that measured 2 and 3 in length.

Phillips and Jones (1969:518) found no dental abnormalities in 23 individuals of this species from Jalisco.

### ***Pteronotus davyi fulvus* (Thomas, 1892)**

#### **Davy's Naked-backed Bat**

*Specimens examined* (37).—2 mi. ESE Plan de Barrancas, 2800 ft., 4; 2 mi. N Milpillas, 3000 ft., 1; 9 mi. NNE Guadalajara, 2; 15 km. W Ameca, 4200 ft., 1; El Zapote, 3 (UNAM); ½ km. N, 3 km. W Jamay, 1650 m., 18 (ENCB); 7½ km. W Jamay, 1500 m., 4 (UNAM); 5 mi. S Grullo, 3100 ft., 1; 3 mi. S Tuxpan, 3800 ft., 1; 5 mi. NW Cuitzamala, 2.

*Additional records*.—Las Peñas (de la Torre, 1955:697); Los Masos (J. A. Allen, 1906:261).

This bat is known from scattered localities in central and western Jalisco, Las Peñas being the type locality. Most of our specimens were captured in mist nets placed over watercourses by dense vegetation. At one locality (5 mi. NW Cuitzamala), two were netted over a lagoon. Known altitudinal distribution ranges from sea level to 4200 feet.

Two females collected on 25 May each contained a single embryo (16.7 and 18.5 in crown-rump length) as did 12 taken on 29 May (average 22.1, range 21-28), and two females obtained on 7 June also were pregnant (embryos 18.1 and 18.6 in length). Testes measured 2, 2, 3, and 3 for four males captured on 29 May and 2 in one taken on 2 July.

### ***Mormoops megalophylla megalophylla* Peters, 1864**

#### **Peter's Leaf-chinned Bat**

*Specimens examined* (97).—5 mi. NE Huejuquilla, 6200 ft., 2; 2 mi. ESE Plan de Barrancas, 1; 15 km. W Ameca, 4200 ft., 2; 3½ mi. S, 2½ mi. E Ocotlán, 5000 ft., 55; 5 mi. W Chapala, 5000 ft., 1; ½ km. N, 3 km. W Jamay, 1650 m., 1 (ENCB); 7½ km. W Jamay, 13 (UNAM); 2 mi. S La Cuesta, 1500 ft., 1; 18 km. NW Purificación, 18; 5 mi. S, 1 mi. E Arado, 1; 7½ mi. SE Tecomate, 1500 ft., 2.

*Additional records*.—9 km. NW Puerto Vallarta (Villa-R., 1967:186); 16 mi. NE Tamazula (Smith, 1972:117); Los Masos (Smith, 1972:117).

This bat is a common resident in the central part of Jalisco, and probably is distributed statewide in suitable habitat. Specimens of which we have record range in altitudinal occurrence from near sea level to 6200 feet.

Many of the bats we examined were collected in daytime retreats such as caves or mines. For example, 13 males and five females were captured by P. L. Clifton in a mine 18 km. NW Purificación that was "still being worked part time." Three other species of bats, *Glossophaga soricina*, *Desmodus rotundus*, and *Natalus stramineus*, were captured in the same roost. A few of our specimens were netted over streams or in arroyos.

All females available to us were taken in the period November through January and none was reproductively active. Males with testes 2 or 3 in length were taken in January, May, and November.

We follow Smith (1972:117) in referring Jaliscan specimens to the subspecies *megalophylla*. Davis and Carter (1962a:65) earlier described *Mormoops megalophylla rufescens* from western México, which allegedly differs from the nominal race in being slightly smaller and somewhat more reddish in color.

#### Family PHYLLOSTOMATIDAE—American Leafed-nosed Bats

##### ***Micronycteris megalotis mexicana* Miller, 1898**

##### Brazilian Small-eared Bat

*Specimens examined* (7).—Tolimán, 2200 ft., 1; 10 mi. SE Tuxpan, 4200 ft., 6.

*Additional records*.—2 mi. N Ciudad Guzmán (de la Torre, 1955:697); Platanar (Miller, 1898:329).

This species reaches the northernmost extent of its western Mexican distribution in Jalisco, where it is known from four localities in the south-central part of the state. Platanar is the type locality of *M. m. mexicana*. Of our material, a specimen from Tolimán was captured in a tunnel (see account of *Balantiopteryx plicata*), whereas six from 10 mi. SE Tuxpan were netted at the entrance to a culvert under a road.

Selected measurements of two males and two females from Jalisco are, respectively: length of forearm, 34.2, 33.9, 36.8, 34.7; greatest length of skull, 18.9, 18.8, 19.3, 18.5; zygomatic breadth, 9.6, 9.3, 9.5, 9.0; postorbital constriction, 4.0, 3.9, 4.0, 3.8; breadth of braincase, 7.9, 8.0, 8.0, 7.7; length of maxillary toothrow, 7.2, 7.2, 7.5, 7.0.

##### ***Micronycteris sylvestris* (Thomas, 1896)**

##### Brown Small-eared Bat

*Specimens examined* (4).—10 km. NW Soyatlán del Oro, 4 (UNAM).

This species, which occurs at least as far north in western México as central Nayarit (Jones, 1964:509), is known in Jalisco only from the one locality cited above (see also Villa-R., 1956:544).

##### ***Macrotus waterhousii bulleri* H. Allen, 1890**

##### Waterhouse's Leaf-nosed Bat

*Specimens examined* (83).—2 mi. E Bolaños, 3550 ft., 1; 12 mi. S, 4 mi. E Yahualica, 5200 ft., 2; 10 mi. W, 9 mi. N Magdalena, 14; 1 mi. NW Tequila, 4000 ft., 25; 4 mi. NNE Teuchitlán, 21; 24 mi. W Guadalajara, 4500 ft., 8; 22 mi. W, 8 mi. S Guadalajara, 4; 10½



mi. E, 11½ mi. S Guadalajara, 1; 2 km. S Puerto Vallarta, 5 (UNAM); 15 km. W Ameca, 4200 ft., 1; Pihuamo, 1 (UNAM).

*Additional records.*—Bolaños and San Pedro, near Guadalajara (Anderson and Nelson, 1965:31); Ameca (Rehn, 1904b:439).

Anderson (1969:2) considered the ecological range of this bat to be tropical and subtropical. The majority of our specimens were obtained in relatively arid areas where subtropical scrub was the dominant vegetation. Some were captured in mist nets placed over waterways; others were taken from daytime retreats in mines and caves. In one instance, a small number of *Macrotus* were observed in a cave with several large rooms located 2 mi. E Bolaños in which *Balantiopteryx plicata*, *Glossophaga soricina*, *Choeronycteris mexicana*, *Desmodus rotundus*, and many *Pteronotus parnellii* and *Leptonycteris sanborni* also were found.

Three females collected on 13 February each carried a single embryo (7-12 in crown-rump length), whereas two of three taken on 2 March were gravid (embryos 8 and 16). A series taken on 25 May at 1 mi. NW Tequila included adult males, adult females (some lactating), and four juveniles (forearms 31.0, 35.4, 35.8, and 37.0). Nelson (1966:143) discussed the deciduous dentition of these same young bats. Females evincing no reproductive activity were taken in February, March, May, July, September, and October.

### ***Glossophaga soricina leachii* (Gray, 1844)**

#### **Pallas' Long-tongued Bat**

*Specimens examined* (181).—2 mi. E Bolaños, 3550 ft., 2; 2 mi. ESE Plan de Barrancas, 1; 2 mi. ENE Magdalena, 5000 ft., 5; 2 mi. N Milpillas, 3000 ft., 4; Ixtapa, 5 (UNAM); 4 mi. NNE Teuchitlán, 5; 10 mi. N Guadalajara, 3350 ft., 2; 9 mi. N Guadalajara, 4000 ft., 2; El Salto, 24 mi. W Guadalajara, 4500 ft., 5; Arroyo de las Pilatas, 10 km. NW Puerto Vallarta, 11 (UNAM); Arroyo de las Camarones, 9 km. NW Puerto Vallarta, 27 (UNAM); Playa las Estadas, Puerto Vallarta, 3 (UNAM); Cerro Ameca, 5 mi. NNW Ameca, 5500 ft., 5; 15 km. W Ameca, 4200 ft., 2; 2 mi. W Ameca, 4000 ft., 7; Sierra de Cuale, 4100 ft., 1; Hda. San Martín, 18 mi. W Chapala, 5000 ft., 2; 11 mi. W Chapala, 1; 2 mi. S La Cuesta, 1500 ft., 6; 6 mi. E Limón, 2700 ft., 6; 11 mi. SW Autlán, 2000 ft. or 710 m., 4; 20 km. WNW Purificación, 1400 ft., 2; 18 km. NW Purificación, 3; El Tabaco, 200 ft., 25; 5 mi. S, 1 mi. E Arado, 2; Tolimán, 2200 ft., 4; 4 mi. N Durazno, 1; Cuitzamala, 25 ft., 3; 2 km. NW Emiliano Zapata, 20 m., 4; 10 mi. NNE Pihuamo, 3500 ft., 6; Pihuamo, 2 (UNAM); 15 km. NW Cihuatlán, 12; 10 mi. NNW Barro de Navidad, 3; Jilotlán de los Dolores, 2400 ft., 6; ca. 30 km. N, 10 km. E Santiago (Colima), 2.

*Additional records.*—Playa Pedregosa, 4 km. S Puerto Vallarta (Villa-R., 1967:231); Ameca (Miller, 1913:420).

Pallas' long-tongued bat is widely distributed in central and western Jalisco at elevations up to at least 5500 feet. We have seen no specimens from that part of the state to the east of Guadalajara and Chapala. Many of our specimens were trapped in mist nets, especially those set over streams or in banana groves. Other places where specimens were taken included a cave, a mine shaft, and a road culvert.

Pregnant females, each with a single embryo, have been collected in the months of February, March, April, September, and October. Fifteen males collected in June had testes that averaged 5.2 (1-7) in length.



Owing to the morphological similarity between *Glossophaga soricina* and *G. commissarisi*, and the fact that the latter was undescribed until 1962, those specimens listed under additional records above and others earlier reported from western México need be re-examined before certain assignment to *G. s. leachii* can be made. The two species have been taken together at four localities in Jalisco, on each occasion in mist nets set over streams.

***Glossophaga commissarisi* Gardner, 1962**  
Gardner's Long-tongued Bat

*Specimens examined* (20).—2 mi. N Milpillas, 3000 ft., 1; 14 mi. WSW Ameca, 5000 ft., 2; 10 mi. SE Talpa de Allende, 5350 ft., 5; 2 mi. S La Cuesta, 1500 ft., 5; 6 mi. E Limón, 2700 ft., 2; 11 mi. SW Autlán, 2000 ft., 2; 20 km. WNW Purificación, 1400 ft., 2; 7½ mi. SE Tecomate, 1500 ft., 1.

This bat has not been reported previously from Jalisco although it presently is known in coastal western México from as far north as Sinaloa (Jones *et al.*, 1972:7). Specimens were taken at altitudes of from 1400 to 5350 feet in the forested hilly or mountainous areas of the west-central part of the state. All individuals of which we have record were netted over watercourses, on four occasions at the same locality with *G. soricina*.

Pregnant females, each with a single embryo, have been taken in February (one), April (two), and September (one), whereas other adult females taken in April (one), May (two), July (three), September (one), November (two), and December (one) were not gravid. A male taken on 2 April had testes that measured 5.5.

*G. commissarisi* markedly resembles the commoner *G. soricina* in external characters but differs from it in a number of cranial features, some of which are: first upper incisors not markedly inclined forward and not noticeably larger than second upper incisors; premaxillary part of rostrum not elongate anterior to canines; lower incisors small, usually evenly spaced between canines, and with noticeable gaps between them; presphenoid ridge flattened distally, tip not well developed. *G. commissarisi* is smaller and darker in color than *soricina* throughout much of their sympatric distribution, but this distinction does not hold in western México and specimens preserved in spirits are especially difficult to distinguish unless the skulls are removed for study or the skin peeled back from the rostrum and lower jaw so as to expose the incisors.

***Anoura geoffroyi lasiopyga* (Peters, 1868)**  
Geoffroy's Tailless Bat

*Specimens examined* (34).—2 mi. N Milpillas, 3000 ft., 10; 9 mi. N Guadalajara, 4000 ft., 1; 15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 3; La Cuesta, 1900 ft., 1; 2 mi. S La Cuesta, 1500 ft., 2; 5 mi. SE La Cuesta, 1200 ft., 1; 7 mi. S Tapalpa, 6800 ft., 1; 3 km. E Venustiano Carranza, 2130 m., 2; Jilotlán de los Dolores, 2400 ft., 13.

*Additional record*.—San Sebastián (Sanborn, 1933:27).

All specimens examined of *A. geoffroyi* were taken in mist nets at moderate elevations. Many were netted over streams that had a dense canopy of tropical

deciduous trees, but at Jilotlán de los Dolores, nets were set in a banana grove. At the three highest elevations whence this bat has been recorded, specimens were netted over streams with a deciduous riparian border in otherwise pine-oak (6800 feet) or pine-fir (6900 feet and 2130 meters) forest.

**Choeronycteris mexicana** Tschudi, 1844

Mexican Long-tongued Bat

*Specimens examined* (25).—La Mesa María de León, 7400 ft., 1; 4½ mi. W Villa Guerrero, 5200 ft., 2; 2 mi. E Bolaños, 3550 ft., 3; 14 mi. SE Lagos de Moreno, 6700 ft., 1; NW side Río Verde, 12 mi. S, 4 mi. E Yahualica, 5200 ft., 3; 2 mi. ESE Plan de Barrancas, 2; 1½ mi. WNW Amatitán, 4100 ft., 1; 9 mi. N Guadalajara, 4000 ft., 1; 23 mi. W, 8 mi. S Guadalajara, 1; 21 mi. SW Guadalajara, 4; 1 mi. W Atotonilco el Alto, 5000 ft., 1; Cueva Hedionda, 10 km. S Huascato, 2 (UNAM); N side Río Ayuquila, 7 mi. NE Autlán, 2; 11 mi. SW Autlán, 2000 ft., 1.

*Additional records*.—1.6 km. W Ajijic (Ingles, 1959:382); Los Masos (J. A. Allen, 1906:261).

This species is known from scattered localities in northern, central, and eastern Jalisco, at altitudes ranging from 2000 to 7400 feet. No specimens are available from the western part of the state, the westernmost records being those located with reference to Plan de Barrancas and Autlán. Bats of this species have been captured in caves (see account of *Macrotus waterhousii*), in mist nets stretched over roads and streams, and in one instance in a night roost in an abandoned adobe building in pine-oak forest (see account of *Tadarida brasiliensis*).

Little is known of the breeding habits of this bat. A female netted on 15 September carried a single fetus that measured 15 in crown-rump length. Females taken in January (one), February (one), March (three), and October (one) evinced no gross reproductive activity; an immature individual (forearm 40.0) was obtained on 10 February.

**Choeroniscus godmani** (Thomas, 1903)

Godman's Bat

*Specimen examined* (1).—2 km. NW Emiliano Zapata, 20 m., 1.

A male (testes 3) was netted on 11 August 1969 over the Río Cuitzamala, under overhanging trees adjacent to the bank. *Pteronotus personatus*, *Glossophaga soricina*, *Sturnira lilium*, and three species of *Artibeus* were taken in the same net. Our specimen provides the first record for Jalisco of this rare species, which has been reported in western México from as far north as southern Sinaloa (Jones *et al.*, 1972:10).

**Hylonycteris underwoodi minor** Phillips and Jones, 1971

Little Long-nosed Bat

*Specimens examined* (10).—2 mi. N Milpillas, 3000 ft., 3; 14 mi. WSW Ameca, 5000 ft., 1; 10 mi. SE Tuxpan, 4200 ft., 2; 10 mi. NNE Pihuamo, 3500 ft., 4.

This relatively rare glossophagine reaches its northernmost distribution in Jalisco (Phillips and Jones, 1971:78-79). All of our specimens were taken in



mist nets as follows: 2 mi. N Milpillas over a small stream lined with dense vegetation; 14 mi. WSW Ameca under tropical deciduous trees in a canyon below oak-covered hillsides; 10 mi. NNE Pihuamo over a creek at a site where trees that lined the bank formed a complete canopy in some places; and 10 mi. SE Tuxpan over a creek lined with dense tropical deciduous forests (pine-oak on nearby hillsides). Other species of bats taken in the same nets with *Hylonycteris* included *Pteronotus davyi*, *P. parnellii*, *Glossophaga soricina*, *Leptonycteris sanborni*, *Anoura geoffroyi*, *Sturnira lilium*, *S. ludovici*, *Artibeus jamaicensis*, *A. phaeotis*, *A. toltecus*, *Chiroderma salvini*, *Desmodus rotundus*, *Myotis californicus*, *Eptesicus furinalis*, and *E. fuscus*.

Among Jaliscan females, the two from 10 mi. SE Tuxpan (6 September) each carried a single embryo, (18 and 21 in crown-rump length); one of two females from northeast of Pihuamo (8 September) was pregnant (single embryo, 14 in crown-rump length), whereas the other and two females from 2 mi. N Milpillas (7 July) evidenced no reproductive activity.

### ***Leptonycteris nivalis* (Saussure, 1860)**

#### **Big Long-nosed Bat**

This bat is known from Jalisco only on the basis of six specimens reported from San Sebastián by Baker and Cockrum (1966:331).

The species *L. nivalis* and *L. sanborni* (see following account) evidently are sympatric in parts of western México (Baker and Cockrum, 1966:329-331), although *sanborni* is the commoner and more widely distributed species in that region. According to Davis and Carter (1962*b*), *nivalis* differs from *sanborni* in having longer and more fluffy pelage, a conspicuous fringe of hairs on the free border of the uropatagium, and in averaging larger in several external and cranial measurements. We find these characters useful in separating representatives of the two species, but note also that the presphenoid ridge is much shorter in *nivalis* and the basisphenoidal pits deeper and more pronounced. Furthermore, Phillips *et al.* (1969:1368-1369) and Jones and Genoways (1970:13-15) have reported the presence in *nivalis* of pitting of the hard palate adjacent to the upper premolars and molars, and occasionally loss of teeth, caused by a macronyssid mite that evidently does not parasitize *sanborni* (see Radovsky *et al.*, 1971).

### ***Leptonycteris sanborni* Hoffmeister, 1957**

#### **Sanborn's Long-nosed Bat**

*Specimens examined* (249).—2 mi. E Bolaños, 3550 ft., 13; 2 mi. ESE Plan de Barrancas, 1; 15 km. W Ameca, 4200 ft., 9; 2 mi. E Ameca, 1 (TTU); El Zapote, 2 (UNAM); 8 mi. NE Ocotlán, 5100 ft., 1; Hda. San Martín, 18 mi. W Chapala, 5000 ft., 3; 11 mi. W Chapala, 5000 ft., 1; 5 mi. W Chapala, 5000 ft., 157; 7½ km. W Jamay, 1500 m., 9 (UNAM); 6 mi. E Limón, 2700 ft., 2; 5 mi. S Grullo, 3100 ft., 1; 20 km. WNW Purificación, 1400 ft., 1; El Tabaco, 200 ft., 39; Toluimán, 2200 ft., 1; 10 mi. NNE Pihuamo, 3500 ft., 3; Pihuamo, 3 (UNAM); Jilotlán de los Dolores, 2400 ft., 2.

*Additional records* (Hoffmeister, 1957:457, unless otherwise noted).—Bolaños; 5 mi. SW Cojumatlán, 5600 ft. (Davis and Carter, 1962*b*:197); Los Masos; Santa Ana Acatlán.



Of the 249 *L. sanborni* examined by us (taken in all months except February, April, May, and December), only 14 were females. These were obtained in January (one), July (one), and October (12), and none was reproductively active.

Specimens for which we have field data were taken in caves or netted over streams or in banana plantations.

Recently, Ramírez-Pulido and Alvarez (1972) resurrected the specific name *yerbabuenae* (Martínez and Villa-R., 1940) to replace *sanborni*, designating as a "lectotype" a paratype from the original series listed by Martínez and Villa-R. This action is invalid under the International Rules of Zoological Nomenclature, which clearly indicate that a lectotype may be designated only from among a syntypic series (Article 74a). Having disposed of this procedural matter, it is noteworthy that Ramírez-Pulido and Alvarez themselves admitted that individuals of two species (those currently identified as *nivalis* and *sanborni*) were among the series originally described under the name *yerbabuenae*. Given, therefore, that the holotype of *Leptonycteris yerbabuenae* has not been found and no longer may be in existence, that the species was originally named on the basis of a composite series, and that the original description carries no information that clearly identifies one or the other of the currently recognized species involved, we think it prudent to consider *yerbabuenae* at best as a *nomen dubium*, or, alternatively, to return it, hopefully forever more, to the synonymy of *Leptonycteris nivalis*.

### **Carollia subrufa** (Hahn, 1905)

#### Hahn's Short-tailed Bat

*Specimen examined* (1).—14½ mi. S Pihuamo, 1100 ft., 1.

A specimen of this short-tailed bat, a female, was netted the night of 5 January 1967 over the Río Barreras. The area of capture was formerly tropical deciduous forest, but had been cleared and planted to corn. Only two other species of bats, *Artibeus jamaicensis* and *A. toltecus*, were taken there.

Our specimen (KU 111486) is the first record of *C. subrufa* from Jalisco and the northernmost for the species. Pine (1972:27) reported this bat from the states of Colima, Guerrero, and Oaxaca in western México. External and cranial measurements of the Jalisco female are: total length, 65; length of tail, 7; length of hind foot, 14; length of ear, 20; length of forearm, 40.7; weight, 7.5; greatest length of skull, 21.7; postorbital breadth, 5.2; breadth of braincase, 9.5; mastoid breadth, 10.6; length of maxillary toothrow, 7.2; breadth across upper molars, 8.0.

### **Sturnira lilium parvidens** Goldman, 1917

#### Yellow-shouldered Bat

*Specimens examined* (292).—4½ mi. W Villa Guerrero, 5200 ft., 1; 1½ mi. WNW Amatitán, 4100 ft., 43; 2 mi. N Milpillas, 3000 ft., 46; 9 mi. N Guadalajara, 4000 ft., 2; El Salto, 24 mi. W Guadalajara, 4500 ft., 21; Atotonilco el Alto, 5000 ft., 31; 2 mi. SE Mascota, 5200 ft., 1; 17 km. SE Talpa, 5200 ft., 1; La Cuesta, 1900 ft., 2; 2 mi. S La Cuesta, 1500 ft., 13; 5 mi. SE La Cuesta, 1; 6 mi. S Mazamitla, 6200 ft., 7; 6 mi. E Limón, 2700 ft., 37; 5 mi. S Grullo, 3100 ft., 6; 11 mi. SW Autlán, 2000 ft. or 710 m., 11; 3 km. E Venustiano Carranza, 2130 m., 1; 20 km. WNW Purificación, 1400 ft., 4; 2 mi. N Ciudad Guzmán,

5000 ft., 6; El Tabaco, 200 ft., 11; Toluimán, 2200 ft., 4; 3 mi. S Tuxpan, 3800 ft., 2; 10 mi. SE Tuxpan, 4200 ft., 2; 4 km. N Durazno, 3; 5 mi. NW Cuitzamala, 6; Cuitzamala, 25 ft., 1; 2 km. NW Emiliano Zapata, 20 m., 2; 2 mi. N Tenacatita, 25 ft., 2; 10 mi. NNE Pihuamo, 3500 ft., 12; 15 km. NW Cihuatlán, 2; 5 mi. NW Barro de Navidad, 200 ft., 2; Jilotlán de los Dolores, 2400 ft., 5; 8 mi. E Jilotlán de los Dolores, 2000 ft., 4.

This yellow-shouldered bat is one of the commonest phyllostomatids in Jalisco, occurring at elevations from sea level to approximately 6500 feet. We lack records only from the northeastern (Mexican Plateau) part of the country—to the north and east of Amatitán, Guadalajara, and Atotonilco el Alto. The majority of our specimens were trapped in mist nets situated in such places as over watercourses, in fruit groves, across roads and trails in forests, and beneath fig trees.

Pregnant females were collected in the months of January, March, April, June, July, and September. A lactating female was obtained in August and spirit-preserved females with prominent mammae (presumably lactating or immediately post-lactating) were taken in April, June, July, August, September, and October. November and December, then, are the only months in which we have no evidence of reproduction in *S. lilium* and we lack adequate samples from these months (two females taken in November, none in December). Two males netted in August had testes that measured 4 and 5, and those of one caught in November measured 3.

### ***Sturnira ludovici occidentalis* Jones and Phillips, 1964**

#### Anthony's Bat

*Specimens examined* (70).—2 mi. N Milpillas, 3000 ft., 12; 10 mi. SE Talpa de Allende, 5350 ft., 3; 17 km. SE Talpa de Allende, 5200 ft., 9; 1 km. W Soyatlán del Oro, 4600 ft., 1 (TTU); 1 km. E Soyatlán del Oro, 4600 ft., 1 (TTU); La Cuesta, 1900 ft., 1; 2 mi. S La Cuesta, 1500 ft., 2; 7 mi. S Tapalpa, 6800 ft., 1; 2 km. E Venustiano Carranza, 2110 m., 5; 3 km. E Venustiano Carranza, 2130 m., 8; 4 km. E Venustiano Carranza, 2160 m., 8; 20 km. WNW Purificación, 1400 ft., 1; Toluimán, 2200 ft., 3; 7½ mi. SE Tecamate, 1500 ft., 1; 10 mi. SE Tuxpan, 4200 ft., 1; 4 km. N Durazno, 11; Jilotlán de los Dolores, 2400 ft., 2.

*Additional records*.—8 mi. W Atenquique, 9100 ft. (Baker and Phillips, 1965:691); Sierra Nevada de Colima (J. A. Allen, 1890:181—see de la Torre, 1954:114); Volcán de Colima (Schaldach, 1966:291).

Of the specimens of *Sturnira ludovici* taken in Jalisco since the description of the subspecies *occidentalis* by Jones and Phillips (1964), all were netted over small streams, mostly bordered by dense vegetation. Several collecting stations were in pine-oak or coniferous forest. This bat has been taken in the state at elevations from 1500 to 9100 feet, at lower elevations frequently in the same nets as *Sturnira lilium*.

Seven of 12 females netted in April were pregnant; each carried a single embryo (11-30 in crown-rump length). The only other pregnant female in our material was captured in July (embryo 18.5) but two May-taken animals were lactating. Of 14 females taken in August, only one (lactating) evidenced reproductive activity. Nonreproductive females were taken also in July (one), September (one), November (five), and December (one). Baker and Phillips (1965:691) reported a lactating female taken on 23 July on the fir-covered slope of El Nevado de Colima.



**Chiroderma salvini scopaeum** Handley, 1966

## Salvin's White-lined Bat

*Specimens examined* (40).—1½ mi. WNW Amatitán, 4100 ft., 1; El Salto, 24 mi. W Guadalajara, 4500 ft., 33; 14 mi. WSW Ameca, 5000 ft., 2; 17 km. SE Talpa de Allende, 5200 ft., 1; La Cuesta, 1900 ft., 1; 2 mi. S La Cuesta, 1500 ft., 1; 8 mi. E Jilotlán de los Dolores, 2000 ft., 1.

Handley (1966:297) first reported Salvin's white-lined bat from Jalisco in the original description of the subspecies *scopaeum*. The species since has been found to be widely distributed in the central and western parts of the state, but evidently is nowhere especially abundant. All of our specimens were taken in mist nets, most commonly over streams or rivers but also in nets set across forest roads and in banana groves. At El Salto, where a total of 33 bats was obtained in September 1965 and in February and June 1966, specimens were netted over a clear, fast-flowing stream under a canopy of wild fig and other deciduous trees.

Two females taken on 14 February each contained a single embryo (18 and 24 in crown-rump length). Five pregnant females netted in June 1966 at El Salto carried embryos averaging 11.4 (6-16) in length. At least four others taken in the same period were lactating. A November-taken male had testes 6.5 long.

**Artibeus hirsutus** Andersen, 1906

## Hairy Fruit-eating Bat

*Specimens examined* (77).—4½ mi. W Villa Guerrero, 5200 ft., 4; 4 mi. W Villa Guerrero, 5500 ft., 1; 1½ mi. WNW Amatitán, 4100 ft., 1; 9 mi. N Guadalajara, 4000 ft., 4; El Salto, 24 mi. W Guadalajara, 4500 ft., 51; 2 mi. ENE Tala, 4500 ft., 6; 4 mi. SSW Ocotlán, 1 (UNAM); 2½ mi. SW Atenquique, 9 (TTU).

*Additional records*.—San Sebastián, 9 km. N Etzatlán (Villa-R., 1967:305); Etzatlán (Andersen, 1908:247).

We have records of this species only from the central part of Jalisco and from the northern panhandle, but it certainly is more widespread than our records indicate. All of our specimens for which collection data are available were taken in mist nets. Those from El Salto, for example, were netted over a stream some 10 meters wide that was bordered by wild figs.

Pregnant females, each with a single embryo, have been taken in February (two of two females examined), June (five of 20), and August (one of two). The female carrying the largest embryo (42 in crown-rump length) weighed 53.5 as opposed to 37.0 for a lactating female taken at the same time. Lactating females were obtained in June and August, and volant young were taken in those same months. Eight males netted in August had testes that averaged 7.8 (6-9) in length and weighed an average of 34.8 (32.5-38.2).

**Artibeus jamaicensis triomylus** Handley, 1966

## Jamaican Fruit-eating Bat

*Specimens examined* (157).—1½ mi. WNW Amatitán, 4100 ft., 13; 2 mi. N Milpillas, 3000 ft., 4; 9 mi. NNE Guadalajara, 1; El Salto, 24 mi. W Guadalajara, 4500 ft., 12; 15 km. W Ameca, 4200 ft., 4; El Zapote, 1 (UNAM); Hda. San Martín, 18 mi. W Chapala, 5000 ft., 4; 2 mi. S La Cuesta, 1500 ft., 5; 6 mi. E Limón, 2700 ft., 8; 5 mi. S Grullo, 3100 ft., 1;



Autlán de la Grana, 1 (UNAM); 11 mi. SW Autlán, 710 m., 1; Contla, 1320 m., 11; El Tabaco, 200 ft., 17; Tolimán, 2200 ft., 8; 7½ mi. SE Tecomate, 1500 ft., 1; 4 km. W Tuxpan, 1380 m., 4; 3 mi. S Tuxpan, 3800 ft., 3; 10 mi. SE Tuxpan, 4200 ft., 4; 4 km. N Durazno, 1; 5 mi. NW Cuitzamala, 5; 2 km. NW Emiliano Zapata, 20 m., 1; 2 mi. N Tenacatita, 25 ft., 2; 10 mi. NNE Pihuamo, 3500 ft., 17; Pihuamo, 2 (UNAM); 14½ mi. S Pihuamo, 1100 ft., 1; 15 mi. NW Cihuatlán, 18; 2 km. NW Barro de Navidad, 2; 1 mi. N Barro de Navidad, 2; Jilotlán de los Dolores, 2; ca. 30 km. N, 10 km. E Santiago (Colima), 1.

*Additional record*.—2 mi. N Ciudad Guzmán (Handley, 1966:300).

The Jamaican fruit-eating bat is a widespread and common species in western and central Jalisco. We have no records from the northeastern part of the state nor from the northern panhandle, although the species may occur locally in favorable habitats in these areas. Most of our specimens were captured in mist nets placed over streams or in banana groves, at elevations from sea level up to 5000 feet. Two specimens from 2 km. NW Barro de Navidad were captured in a small cave in the side of a cliff along with *Saccopteryx bilineata* and *Balan-tiopteryx plicata*.

Gravid females were recorded in all months from January through June, whereas lactating individuals were taken in April, May, July, August, September, and October. Nine pregnant females netted on 29 June each carried a single embryo averaging 32.6 (27-40) in crown-rump length. Two August-taken males had testes measuring 8 and 10 in length.

Populations of this species in western México were referred to the subspecies *A. j. jamaicensis* for many years prior to Handley's (1966:299-300) description of *A. j. triomylus*. Recently, Davis (1970b) has reviewed infraspecific variation in *A. jamaicensis* in North America, and he followed Handley in the use of *triomylus* for bats from Jalisco and adjacent regions.

### ***Artibeus lituratus palmarum* Allen and Chapman, 1897** Big Fruit-eating Bat

*Specimens examined* (155).—2 mi. ESE Plan de Barrancas, 2; 1½ mi. WNW Amatitán, 4100 ft., 20; 2 mi. N Milpillas, 3000 ft., 4; 9 mi. N Guadalajara, 4000 ft., 1; 8 km. SW Puerto Vallarta, 1 (UNAM); Atotonilco el Alto, 5000 ft., 43; El Zapote, 1 (UNAM); La Cuesta, 1900 ft., 3; 2 mi. S La Cuesta, 1500 ft., 3; 6 mi. E Limón, 2700 ft., 12; Autlán de la Grana, 5 (UNAM); 11 mi. SW Autlán, 2000 ft. or 710 m., 2; 20 km. WNW Purificación, 1400 ft., 1; El Tabaco, 200 ft., 5; Tolimán, 2200 ft., 9; 7½ mi. SE Tecomate, 1500 ft., 1; 4 km. W Tuxpan, 1380 m., 2; 3 mi. S Tuxpan, 3800 ft., 3; 10 mi. SE Tuxpan, 4200 ft., 5; Cuitzamala, 25 ft., 1; 2 km. NW Emiliano Zapata, 20 m., 1; 10 mi. NNE Pihuamo, 3500 ft., 20; 15 km. NW Cihuatlán, 1; 5 km. NNW Barro de Navidad, 3; Jilotlán de los Dolores, 2400 ft., 4; 8 mi. E Jilotlán de los Dolores, 2000 ft., 2.

*Additional record*.—Las Peñas (Puerto Vallarta) (J. A. Allen, 1897:48).

This fruit-eating bat is widely distributed in Jalisco, having been taken in all parts of the state except the high plains of the east and the panhandle of the north, at elevations up to 5000 feet. Like other members of the genus, *A. lituratus* is found in a variety of habitats having a ready supply of ripe fruit. Specimens were netted in such situations as over streams, along roads and trails in forest, and in banana and other fruit groves. The 43 specimens from Atotonilco el Alto were

netted in a mango plantation in which *Sturnira lilium* and *Lasiurus borealis* were the only other species of bats taken.

Eight of 36 females autopsied were gravid, each with a single embryo, in March (two), April (two), June (three), and July (one); embryos measured, respectively, 46, 40, 37, 37, 33, 31, 37, and 41 in crown-rump length. Lactating females, or animals preserved in alcohol that had enlarged mammae and presumably had been lactating recently, were taken in the months of March, April, July, August, September, and October.

A male captured on 27 July had testes that measured 12.5 and those of another taken on 11 August measured 6. Four bats netted in August (three females, two of which were lactating, and one male) had an average body weight of 57.4 (45.6-64.4).

### ***Artibeus aztecus aztecus* Andersen, 1906**

#### Aztec Fruit-eating Bat

*Specimens examined* (5).—2 km. E Venustiano Carranza, 2100 m., 1; 2 mi. N Ciudad Guzmán, ca. 4850 ft., 4.

*Additional record*.—N slope Nevado de Colima, 8000 ft. (Davis, 1969:21).

This inhabitant of the Middle American highlands reaches the northernmost limit of its range in western México, where it is known from as far north as southern Sinaloa. The altitudinal range in Jalisco overlaps that of *A. toltecus*, being from about 4800 to at least 8000 feet.

Circumstances under which our four specimens, all males, from near Ciudad Guzmán were collected are not known. The one other specimen examined, a male (testes 6), was netted before midnight on 9 August 1969 over a small, nearly dry stream in pine forest. Five *Sturnira ludovici* were caught in the same net that night. Other bats captured in nets placed less than a mile distant over the same stream included *Anoura geoffroyi*, *Sturnira lilium*, *Myotis auriculus*, and *M. velifer*.

### ***Artibeus toltecus hesperus* (Davis, 1969)**

#### Toltec Fruit-eating Bat

*Specimens examined* (180).—4½ mi. W Villa Guerrero, 5200 ft., 1; 2 mi. ESE Plan de Barrancas, 2800 ft., 6; 1½ mi. WNW Amatitán, 4100 ft., 35; 2 mi. N Milpillas, 3000 ft., 2; 9 mi. NE Guadalajara, 4000 ft., 7; El Salto, 24 mi. W Guadalajara, 4500 ft., 57; 14 mi. WSW Ameca, 5000 ft., 2; 10 mi. SE Talpa de Allende, 5350 ft., 2; 17 km. SE Talpa de Allende, 5350 ft., 1; 4 km. N Soyatlán del Oro, 1 (TTU); 2 km. W Soyatlán del Oro, 1 (TTU); La Cuesta, 1900 ft., 1; 2 mi. S La Cuesta, 1500 ft., 7; 6 mi. E Limón, 2700 ft., 9; 5 mi. S Grullo, 3100 ft., 3; 11 mi. SW Autlán, 2000 ft., 4; 3 km. E Venustiano Carranza, 2130 m., 1; 7½ mi. SE Tecomate, 1500 ft., 1; 4 km. W Tuxpan, 1380 m., 3; 3 mi. S Tuxpan, 3800 ft., 3; 4 km. N Durazno, 1; 2 mi. N Tenacatita, 25 ft., 2; 10 mi. NNE Pihuamo, 3500 ft., 7; 14½ mi. S Pihuamo, 1100 ft., 1; 15 km. NW Cihuatlán, 1; 5 mi. NW Barro de Navidad, 200 ft., 1; Jilotlán de los Dolores, 2400 ft., 19; 8 mi. E Jilotlán de los Dolores, 2000 ft., 1.

*Additional records* (Davis, 1969:26, unless otherwise noted).—Teuchitlán (Andersen, 1908:300); 1 km. E Soyatlán del Oro, 4600 ft.; La Cumbre, 9 mi. SSW Autlán; 2 mi. N Ciudad Guzmán (de la Torre, 1955:698); Artenkiki (Atenquique); Los Masos (J. A. Allen, 1906:261); Platanar (Andersen, 1908:300).



Of the 68 females of *A. toltecus* examined, 39 were either pregnant or evinced recent lactation. Pregnant individuals (each with a single embryo) were obtained in the months of January (nine bats, embryos 4.5-8.5 in crown-rump length), February (seven, 11-28), March (one, 20), April (five, 16-27), June (10, 11.5-25.5), and July (one, 21). A lactating female was taken in August and females preserved in alcohol that had enlarged mammae, indicating recent or current lactation, were collected in January, June, July, and September. Volant young were captured in August and September. Five males captured on 14 August had testes 3 or 4 in length.

All of our specimens of this small stenodermine were trapped in mist nets—mostly over forest-lined streams, but also over roads and in banana groves. The two netting sites at which 35 or more individuals were taken were over streams having a riparian community of fruit-bearing trees in areas that otherwise were heavily cultivated. Davis (1969:26) noted that *A. t. hesperus* normally occurs at elevations below 4500 feet. We have specimens from five localities above that altitude, the highest being 2130 meters (approximately 6900 feet) in the vicinity of Venustiano Carranza.

***Artibeus phaeotis nanus* Andersen, 1906**  
Dwarf Fruit-eating Bat

*Specimens examined* (98).—2 mi. N Milpillas, 3000 ft., 1; La Cuesta, 1900 ft., 1; 2 mi. S La Cuesta, 1500 ft., 4; 5 mi. SE La Cuesta, 1200 ft., 1; 6 mi. E Limón, 2700 ft., 1; Autlán de la Grana, 2 (UNAM); 11 mi. SW Autlán, 2000 ft. or 710 m., 4; 20 km. WNW Purificación, 1400 ft., 1; El Tabaco, 200 ft., 43; 5 mi. NW Cuitzamala, 4; 2 km. NW Emiliano Zapata, 20 m., 2; 2 mi. N Tenacatita, 25 ft., 1; 10 mi. NNE Pihuamo, 3500 ft., 6; Pihuamo, 4 (UNAM); 15 km. NW Cihuatlán, 9; Cihuatlán, 15 ft., 2; 5 km. NW Barro de Navidad, 1; Jilotlán de los Dolores, 2400 ft., 5; 8 mi. E Jilotlán de los Dolores, 2000 ft., 6.

*Additional records* (Davis, 1970a:400).—7 mi. SSW La Cumbre de Autlán; San Marcos, ca. 3000 ft.

This species evidently is restricted to the areas of tropical deciduous forest and thorn forest in Jalisco. The highest elevation from which we have taken specimens is 3500 feet. Davis (1970a:400) noted the affinity of *A. phaeotis* for banana groves and our series of 43 bats from El Tobacco were netted in just such a situation. Other specimens were netted in similar habitat, or over streams, ponds, or roads.

Gravid females (one embryo each) are available for the months of January (six), April (one), and June (11), and a lactating individual was taken in August. A November-taken male had testes that measured 4.5.

***Enchisthenes hartii* (Thomas, 1892)**  
Little Fruit-eating Bat

*Specimen examined* (1).—10 mi. SE Talpa de Allende, 5350 ft., 1.

The first specimens of this fruit-eating bat reported from western México were from 2 mi. N Ciudad Guzmán, Jalisco (de la Torre, 1955:700). The second locality (Jones, 1964:512) of record and the only other known to us from the state



TABLE 1.—*Selected measurements of Centurio senex senex from Jalisco and Nicaragua.*

| Number of<br>specimens averaged<br>or catalogue number,<br>and sex | Length of<br>forearm | Condylobasal<br>length | Zygomatic<br>breadth | Postorbital<br>constriction | Length of max-<br>illary toothrow | Breadth across<br>upper molars |
|--|----------------------|------------------------|----------------------|-----------------------------|-----------------------------------|--------------------------------|
| Western Jalisco  |                      |                        |                      |                             |                                   |                                |
| KU 103634,♂  | 41.5                 | 14.3                   | 14.7                 | 4.9                         | 5.1                               | 10.4                           |
| Average 5♀   | 43.9                 | 15.1                   | 15.1                 | 5.1                         | 5.2                               | 10.9                           |
| Minimum  | 43.0                 | 14.9                   | 14.9                 | 5.0                         | 5.1                               | 10.8                           |
| Maximum  | 44.7                 | 15.3                   | 15.3                 | 5.3                         | 5.3                               | 11.0                           |
| Nicaragua  |                      |                        |                      |                             |                                   |                                |
| Average 7♀   | 42.4                 | 14.6*                  | 14.7                 | 4.9                         | 4.9                               | 10.5                           |
| Minimum  | 41.5                 | 14.5                   | 14.4                 | 4.7                         | 4.8                               | 10.5                           |
| Maximum  | 42.8                 | 14.9                   | 15.0                 | 5.0                         | 5.1                               | 10.7                           |
| Average 4♀   | 42.9                 | 14.9                   | 15.0                 | 5.1                         | 5.2                               | 10.8                           |
| Minimum  | 42.5                 | 14.8                   | 14.8                 | 5.1                         | 5.2                               | 10.6                           |
| Maximum  | 43.7                 | 15.0                   | 15.1                 | 5.2                         | 5.3                               | 11.0                           |

\*6 specimens only.

is represented by the specimen listed above. This animal, a male, was trapped in a mist net stretched under overhanging trees across a mountain stream in the pine-oak zone.

Centurio senex senex Gray, 1842  
Wrinkle-faced Bat

*Specimens examined* (10).—2 mi. S La Cuesta, 1500 ft., 1; 6 mi. E Limón, 2700 ft., 2; 11 mi. SW Autlán, 2000 ft. or 710 m., 4; 4 km. N Durazno, 1; 2 mi. N Tenacatita, 25 ft., 2.

The wrinkle-faced bat is known to occur as far north as Sinaloa in western México and first was reported from Jalisco by Jones (1964:512) on the basis of the specimen listed from north of Durazno. Since that time, nine additional specimens have been collected at four other localities. All our record-stations are in the western half of the state, well within the tropical subdeciduous and deciduous forest zones at elevations from near sea level up to 2700 feet.

All specimens examined were taken in mist nets over watercourses. On 12 August 1969, for example, at a place 11 mi. SW Autlán, a single *Centurio* was trapped in a mist net that had been placed over a small, shallow creek (approximately two feet wide) located at the bottom of a deep, heavily vegetated ravine. The bat was caught after midnight and was entangled only three inches above the ground. The same net had trapped *Glossophaga soricina*, *Sturnira lilium*, *Artibeus lituratus*, *A. jamaicensis*, *A. phaeotis*, and *Myotis nigricans* earlier in the night.

Two of three females netted on 1 and 2 March 1966 were pregnant, each with a single embryo (18.5 and 24.8 in crown-rump length), whereas the third may have been recently lactating as suggested by enlarged mammae. A female captured on 12 August 1969 was lactating; one netted on 26 September 1965 was immature as evidenced by unfused phalangeal epiphyses and woolly, grayish pelage.

Paradiso (1967) recently reviewed the systematic status of *Centurio senex*, but examined no material from western México. Jaliscan specimens compare favorably in size (see Table 1) with bats from the vicinity of the restricted type locality and elsewhere in Nicaragua. Three nonpregnant Jaliscan females weighed 19.1, 19.5, and 23.2.

**Desmodus rotundus murinus** Wagner, 1840  
Vampire Bat

*Specimens examined* (238).—4 mi. W Villa Guerrero, 5500 ft., 2; 2 mi. E Bolaños, 3550 ft., 3; 2 mi. ESE Plan de Barrancas, 2800 ft., 3; 10 mi. W, 9 mi. N Magdalena, 35; 1 mi. NW Tequila, 4000 ft., 30; 1½ mi. WNW Amatitán, 4100 ft., 2; Cueva de Ginés, Etzatlán, 1220 m., 8 (UNAM); 4 mi. NNE Teuchitlán, 1; El Salto, 24 mi. W Guadalajara, 2; 21 mi. SW Guadalajara, 28; Arroyo de los Camarones, 9 km. NW Puerto Vallarta, 5 (UNAM); 15 km. W Ameca, 4200 ft., 1; 2 mi. W Ameca, 4000 ft., 6; ¼ mi. ENE Villa Corona, 4500 ft., 7; Sierra de Cuale, 4100 ft., 3; 15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 2; 4 mi. SSE Ocotlán, 1 (TTU); 17 km. NNW Soyatlán del Oro, 3 (UNAM); 11 mi. W Chapala, 5000 ft., 4; 7 mi. W Chapala, 5000 ft., 1; 5 mi. W Chapala, 5000 ft., 12; 7½ km. W Jamay, 2 (UNAM); ½ mi. SW San Luis Soyatlán, 5100 ft., 7; Lago Sayula, 6 mi. N, 2 mi. E Atoyac, 4400 ft., 4; 6 mi. E Limón, 2700 ft., 12; 4 mi. N, 2½ mi. E Autlán, 1; Autlán de la Grana, 2 (UNAM); 11 mi. SW Autlán, 710 m., 2; 18 km. NW Purificación, 3; Tolimán, 2200 ft., 14; 4 km. W Tuxpan, 1380 m., 2; 10 mi. SE Tuxpan, 4200 ft., 1; 5 mi. NW Cuitzamala, 10; 10 mi. NNE Pihuamo, 3500 ft., 8; Pihuamo, 2 (UNAM); 8 mi. E Jilotlán de los Dolores, 2000 ft., 1; ca. 30 km. N, 10 km. E Santiago, 8.

*Additional records*.—Ajijic (Ingles, 1959:384); Las Canoas (J. A. Allen, 1906:262).

The vampire bat is widely distributed in Jalisco and evidently is one of the commonest species occurring in the state. We lack records only from the Mexican Plateau section of the northeast. Our specimens were taken in caves or abandoned mines, or trapped in mist nets set in a variety of habitats.

Pregnant females are available in our material from the months of January through July and from as late as September, and a lactating individual was taken in August. The vast majority of gravid females autopsied, however, are from the period January through May and no reproductive activity was noted in females collected in the last three months of the year. Immature bats are represented in the specimens at hand from May, June, and July.

Family NATALIDAE—Funnel-eared Bats

**Natalus stramineus saturatus** Dalquest and Hall, 1949  
Funnel-eared Bat

*Specimens examined* (86).—Cueva de Ginés, Etzatlán, 1220 m., 10 (UNAM); Arroyo de los Camarones, 9 km. NW Puerto Vallarta, 6 (UNAM); Cerro Ameca, 5 mi. NNW Ameca, 5500 ft., 19; Sierra de Cuale, 7300 ft., 2; Sierra de Cuale, 10 km. W Talpa de Allende, 4100



ft., 21; Mina de las Garrochas, 17 km. NNW Soyatlán del Oro, 8 (UNAM); 18 km. NW Purificación, 11; 5 mi. S, 1 mi. E El Arado, 3; 2 mi. NE La Huerta, 1100 ft., 5; 5 km. NNW Barro de Navidad, 1.

*Additional records.*—Itzatlán (Goodwin, 1959:7); Ameca (Miller, 1902:400).

All funnel-eared bats examined for which ecological data are available were taken in caves or mines at elevations from near sea level up to 7300 feet in the Sierra de Cuale. Eleven bats, five males and six females, from a mine 18 km. NW Purificación, collected on 21 November 1962, were found in association with *Glossophaga soricina* and *Desmodus rotundus*. We tentatively follow Goodwin (1959) in use of the subspecific name *saturatus* for Jaliscan specimens.

Eight pregnant females captured on 8 June at Cerro Ameca each carried a single embryo (12-15 in crown-rump length).

#### Family VESPERTILIONIDAE—Vespertilionid Bats

#### **Myotis yumanensis lutosus** Miller and Allen, 1928

##### Yuma Myotis

*Specimens examined* (18).—Cuarenta, 6300 ft., 10; El Salto, 24 mi. W Guadalajara, 1280 m., 7; 2 mi. S La Cuesta, 1500 ft., 1.

Excepting a recent paper by Jones *et al.* (1971:416) in which the specimens here reported also were listed, the Yuma myotis is recorded from Jalisco only on the basis of two individuals of unknown provenience (Miller and Allen, 1928:72). Our specimens from Cuarenta were shot from a night roost under a small bridge. Those from El Salto were netted, along with more than a dozen other species of bats, over a wide, shallow stream bordered by dense trees that formed a complete canopy; relatively open grazed and farmed areas were adjacent to the stream. The specimen from near La Cuesta also was netted over a stream.

Two of four females taken on 14 August 1969 at El Salto were lactating. A male taken at the same time had testes that measured 2 in length.

#### **Myotis velifer velifer** (J. A. Allen, 1890)

##### Cave Myotis

*Specimens examined* (98).—12 mi. W Encarnación de Díaz, 5600 ft., 5; 14 mi. SE Lagos de Moreno, 6700 ft., 1; 2 mi. NW Magdalena, 4500 ft., 1; 1 mi. NE Tala, 4400 ft., 1; 2 mi. SE Mascota, 5200 ft., 11; Atenguillo, 1; 13 mi. S, 15 mi. W Guadalajara, 21; 21 mi. SW Guadalajara, 11; Hda. San Martín, 5000 ft., 18 mi. W Chapala, 3; 15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 5; 4 mi. E Atemajac de Brizuela, 8000 ft., 1; 6 mi. E Limón, 2700 ft., 7; 5 mi. S Grullo, 3100 ft., 1; 6 mi. S Mazamitla, 6200 ft., 17; 3 km. E Venustiano Carranza, 2130 m., 1; 4 km. E Venustiano Carranza, 2160 m., 10; 4 km. W Tuxpan, 1380 m., 1.

*Additional records* (Miller and Allen, 1928:91, unless otherwise noted).—Guadalajara; Lake Zacoalco; Tenamastlán (Villa-R., 1967:367); Las Canoas; Atenquique; San Marcos; Tonila; Zavala.

The cave myotis is the commonest and most widespread member of the genus in western México. In Jalisco, it occurs in a variety of habitats at elevations up to at least 8000 feet. We have examined no *M. velifer* from areas of tropical forest in the western part of the state, however, and the species may not occur there,



particularly in coastal environments. Many of our specimens were taken in mist nets, but others were shot in flight or captured in abandoned buildings.

Among the females at hand, only an individual taken on 20 May was gravid (crown-rump length of embryo 13.5). Two August-taken males had testes that measured 5 and 8.

***Myotis fortidens fortidens* Miller and Allen, 1928**  
Cinnamon Myotis

*Specimens examined* (6).—El Tabaco, 200 ft., 6.

Although the cinnamon myotis has been reported as far north as Sonora in western México (Findley and Jones, 1967:442), our series represents the first specimens known from Jalisco (see also Jones *et al.*, 1971:411). All males, these were netted along pathways cut through a dense, old banana grove. Many phyllostomatids, *Pteronotus parnellii*, and *Lasiurus ega* were taken in the same nets.

***Myotis auriculus apache* Hoffmeister and Krutzsch, 1955**  
Big-eared Myotis

*Specimens examined* (2).—4 km. E Venustiano Carranza, 2160 m., 1; 10 mi. NNE Pihuamo, 3500 ft., 1.

*Additional record*.—Los Masos (Findley, 1960:20).

Only three specimens of this bat are known from Jalisco — one from Los Masos (Findley, 1960:20) and the two herein reported. A male from 4 km. E Venustiano Carranza was taken in a net stretched across a dry stream bed under a large, overhanging tree. Coniferous forest grew on a hillside to one side of the stream bed and a large, heavily-grazed field was adjacent on the other. Several *Myotis velifer* and *Sturnira ludovici* were taken in the same net; the *auriculus* may have been attracted to the vicinity of the net by the squeaking of a hand-held *M. velifer*. A female from 10 mi. NNE Pihuamo was netted over a small stream, which was lined with trees that formed a complete canopy over it.

External and cranial measurements of our two specimens were reported by Jones *et al.* (1971:410). Genoways and Jones (1969) discussed reasons for use of the specific name *auriculus* for this bat, formerly regarded (Findley, 1960) as a representative of *Myotis keenii*.

***Myotis thysanodes thysanodes* Miller, 1897**  
Fringed Myotis

*Specimens examined* (2).—10 mi. SE Talpa de Allende, 5350 ft., 2.

*Additional records* (Miller and Allen, 1928:127).—La Laguna; Los Masos.

Our two specimens were netted by Percy L. Clifton on 14 May 1964 between midnight and 7 AM over a pool in a mountain stream. Tall deciduous trees grew along the stream, whereas pine-oak forest clothed the surrounding hillsides. Other species netted there included *Pteronotus parnellii*, *Glossophaga soricina*, *Enchisthenes hartii*, and *Eptesicus fuscus*. A specimen listed in the original description of the species (Miller, 1897:83) from Sierra Nevado de Colima is unaccounted for in subsequent publications.

Both bats were pregnant, each with a single embryo; the embryos measured 18 and 15 in crown-rump length.

***Myotis volans amotus* Miller, 1914**

Long-legged *Myotis*

*Specimens examined* (3).—15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 3.

*Additional records*.—Los Masos (Miller and Allen, 1928:145); 8 mi. W Atenquique, 9100 ft. (Baker and Phillips, 1965:691).

Our specimens of this relatively rare subspecies were netted on 20 May 1964 over pools in a small stream that flowed through a valley cleared for grazing, but surrounded by hills covered with pine and fir. Other species, all Vesperilionids, taken in the same nets included *Myotis velifer*, *Eptesicus fuscus*, *Lasiurus borealis*, *L. cinereus*, and *L. intermedius*. Two of our three specimens are females and each carried an embryo (16 and 18 in crown-rump length).

Baker and Phillips (1965:691) reported *M. volans* from the southeast slope of El Nevado de Colima, where specimens were taken under a loose piece of bark on a large fir tree. At least two of 18 females reported by them were lactating in late July.

***Myotis californicus mexicanus* (Saussure, 1860)**

California *Myotis*

*Specimens examined* (5).—10 mi. N Guadalajara, 3350 ft., 1; 2 mi. SE Mascota, 5200 ft., 1; Sierra de Cuale, 7300 ft., 1; 5 mi. W Atenquique, 7700 ft., 1; Volcán de Fuego, 9800 ft., 1.

*Additional records* (Miller and Allen, 1928:160).—Santa Rosalía; Sierra Nevado de Colima; Los Masos.

*M. c. mexicanus* has been reported previously from Jalisco by Miller and Allen (1928:160), Genoways and Jones (1967:477-478), and Jones *et al.* (1971:410). Most of our specimens were netted or shot in pine-oak forest or pine-oak mixed with fir. The one from north of Guadalajara was shot from a night roost in a culvert located in the barranca of the Río Grande de Santiago, an area where the vegetation was predominantly tropical in nature. Testes of a male taken on 26 October measured 3.5.

***Myotis nigricans extremus* Miller and Allen, 1928**

Black *Myotis*

*Specimens examined* (10).—14 mi. WSW Ameca, 5000 ft., 1; 2 mi. S La Cuesta, 1500 ft., 1; Contla, 1320 m., 1; 11 mi. SW Autlán, 710 m., 1; ca. 30 km. N, 10 km. E Santiago (Colima), 1; 15 km. NW Cihuatlán, 5.

*Additional record*.—16 mi. NE Tamazula (Davis and Carter, 1962a:72).

This Neotropical species has been reported previously from Jalisco by Davis and Carter (1962a:72), Jones (1964:513), and Jones *et al.* (1971:413). *M. nigricans* is known from as far north in western México as the vicinity of San Blas, Nayarit (Gardner, 1962:103).

All of our specimens were netted over ponds or streams. The one from the highest elevation (5000 feet) was the only bat taken in two nets stretched over a



stream in a tropically-vegetated canyon situated between oak-covered hills. No females taken in April or May that we examined were reproductively active.

***Pipistrellus hesperus hesperus* (H. Allen, 1864)**

Western Pipistrelle

*Specimens examined* (22).—5 mi. NE Huejuquilla, 6200 ft., 2; 2 mi. E Bolaños, 3550 ft., 1; 1 mi. NE Tala, 4400 ft., 2; 21 mi. SW Guadalajara, 5200 ft., 15; 27 mi. S, 12 mi. W Guadalajara, 1; 6 mi. E Limón, 2700 ft., 1.

*Additional record*.—Barranca Ibarra (Findley and Traut, 1970:760).

The western pipistrelle occurs in the semiarid parts of Jalisco, being unrecorded only from the areas of deciduous and subdeciduous forest. We have records from as low as 2700 feet in elevation (6 mi. E Limón) and as high as 6200 feet (5 mi. NE Huejuquilla). Details of capture are not available for all our specimens; those for which data are available were shot as they foraged in the early evening or (in one instance) netted over a small stream.

Of the 14 females examined that were taken 21 mi. SW Guadalajara on 25 and 26 April, one carried two embryos (15 in crown-rump length) and six evinced signs of recent lactation. We follow Findley and Traut (1970) in referring Jaliscan specimens to *P. h. hesperus*.

***Eptesicus fuscus miradorensis* (H. Allen, 1866)**

Big Brown Bat

*Specimens examined* (24).—Chinampas, 7000 ft., 1; 3 mi. N Guadalajara, 5000 ft., 1; El Salto, 24 mi. W Guadalajara, 4500 ft., 3; Sierra de Cuale (ca. 10 km. W Talpa de Allende), 4100 ft., 1; 10 mi. SE Talpa de Allende, 5350 ft., 3; 17 km. SE Talpa de Allende, 5200 ft., 1; 15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 3; 4 mi. E Atemajac de Brizuela, 8000 ft., 1; 3 mi. SW Mazamitla, 2; 6 mi. E Limón, 2700 ft., 4; 5 mi. S Grullo, 3100 ft., 1; 4 km. W Tuxpan, 1380 m., 1; 10 mi. NNE Pihuamo, 3500 ft., 2.

*Additional records*.—Sierra [Nevado] de Colima (J. A. Allen, 1890:176); Los Masos (J. A. Allen, 1906:260).

The big brown bat probably occurs throughout Jalisco excepting in the tropical zone of the western part of the state. Save for three bats that were shot as they foraged, all our specimens were netted over watercourses, mostly those lined with relatively dense trees and bushes. At 4 km. W Tuxpan, however, a big brown bat was taken in a net over an arroyo bordered by xerophytic vegetation. Places of capture varied in elevation from 2700 to 8000 feet.

A female taken on 14 May carried a single embryo measuring 16 (crown-rump length), and June-taken females were lactating.

***Eptesicus furinalis gaumeri* (J. A. Allen, 1897)**

Tropical Brown Bat

*Specimens examined* (9).—Sierra de Cuale (ca. 10 km. W Talpa de Allende), 4100 ft., 1; 2 mi. S La Cuesta, 1500 ft., 2; 10 mi. NNE Pihuamo, 3500 ft., 5; 15 km. NW Cihuatlán, 1.

The specimens herein listed represent the northernmost records for this bat in western México (see Jones, 1964:513, and Davis, 1965:235). All were netted over waterways save the male from Sierra de Cuale, which was shot as it foraged along a stream in pine-oak (mostly oak) forest; a single *Eptesicus fuscus mira-*



*dorensis* also was taken there. We found no gross reproductive activity in females taken in April (one) or September (five).

***Lasiurus borealis teliotus* (H. Allen, 1891)**

Red Bat

*Specimens examined* (22).—2 mi. ESE Plan de Barrancas, 2800 ft., 1; Atotonilco el Alto, 5000 ft., 1; 2 mi. SE Mascota, 5200 ft., 1; 17 km. SE Talpa de Allende, 5200 ft., 1; 15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 1; 2 mi. S La Cuesta, 1500 ft., 3; SW shore of Lake Chapala, 1 (UNAM); 5 mi. S Grullo, 3100 ft., 7; 20 mi. SE Autlán, 7700 ft., 4; 4 km. N Durazno, 1; Cihuatlán, 15 ft., 1.

*Additional records*.—Los Masos (J. A. Allen, 1906:260); no specific locality (Miller, 1897:112).

The red bat evidently occurs in Jalisco mostly at elevations above 5000 feet in forests of pine-oak, pine, and fir. Record stations range in elevation from 15 (Cihuatlán) to 7700 feet (20 mi. SE Autlán). Most of our specimens were taken in mist nets over water. A female from Atotonilco el Alto was netted in a mango orchard, whereas nets were placed over streams that meandered through large forest clearings at two other localities listed above.

Specimens taken 5 mi. S Grullo on 20 and 21 October carried heavy fat deposits. A male netted on 23 April weighed 6.5 and another taken on 4 November weighed 8.5; a female obtained on 31 March weighed 8.4.

A few red bats may be year-round residents of Jalisco; most, however, evidently are migrants or residents only in the drier months of the year. The 22 specimens we examined were collected in March (one female), April (six males, two females), May (one male), June (one male), July (one female), October (two males, five females), November (one each sex), and December (one male). None of the females was reproductively active.

***Lasiurus cinereus cinereus* (Palisot de Beauvois, 1796)**

Hoary Bat

*Specimens examined* (13).—5 mi. NE Huejuquilla, 6200 ft., 1; 2 mi. SE Mascota, 5200 ft., 1; 17 km. SE Talpa de Allende, 5200 ft., 1; 15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 3; 20 mi. SE Autlán, 7700 ft., 7.

*Additional records*.—"Hidalgo San Marcos, Tonila" (J. A. Allen, 1890:177); Los Masos (J. A. Allen, 1906:260).

This species occurs in Jalisco principally in the mountainous highlands. Localities from which we have records range in elevation from 5000 (Tonila) up to 7700 feet. Seven males taken at a place 20 mi. SE Autlán were netted over a slow-moving stream situated in a large clearing. A forest of predominately pine-oak, but interspersed with broad-leafed trees and firs, occurred on the surrounding hillsides. Four red bats were captured in the same net.

Of the 13 specimens we have examined, 12 are males, which were obtained in the months of April, May, and November. The single female was taken on 31 March 1965. A male captured on 5 November 1962 had testes that measured 4. As in the case of *L. borealis*, the hoary bat may be a winter resident of Jalisco or may pass through the state in spring and autumn migrations.

***Lasiurus intermedius intermedius* H. Allen, 1862**

## Big Yellow Bat

*Specimens examined* (4).—5 mi. SSE Mascota, 5400 ft., 1; 10 mi. SE Talpa de Allende, 5350 ft., 2; 15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 1.

The few records of this bat from Jalisco suggest that it may be restricted to highland forests. Specimens examined, all males, were netted over small streams in April and May, and it is unknown whether the species resides in Jalisco the year round. Vegetation in the vicinity of netting sites was primarily pine-oak forest. This yellow bat first was reported from Jalisco by Jones (1964:514) based on two of the specimens listed above.

***Lasiurus ega xanthinus* (Thomas, 1897)**

## Southern Yellow Bat

*Specimens examined* (4).—El Salto, 24 mi. W Guadalajara, 1280 m., 1; 5 mi. S Grullo, 3100 ft., 1; Tolimán, 2200 ft., 1; El Tabaco, 200 ft., 1.

The southern yellow bat probably occurs in suitable habitat throughout much of Jalisco; our specimens, the first to be reported from the state, are from a rather wide range of elevations. Little is known of the habits of this bat, although it is thought to be a relatively sedentary species and may well breed in Jalisco. Those reported herein were taken in the months of June, August, and October.

Jaliscan specimens, two males and two females (neither reproductively active), were captured in mist nets set in an orchard, banana grove, and in two instances over streams coursing beneath wild fig trees. An August-taken female weighed 10.9.

***Rhogeessa parvula parvula* H. Allen, 1866**

## Little Yellow Bat

*Specimens examined* (14).—9 mi. N Guadalajara, 4000 ft., 4; 2 mi. S La Cuesta, 1500 ft., 3; 5 mi. NW Cuitzamala, 1; Cuitzamala, 25 ft., 1; 2 mi. N Tenacatita, 25 ft., 2; 10 mi. NNE Pihuamo, 3500 ft., 3.

We know of no previously published records of the little yellow bat for Jalisco, although the species is widely distributed in western México (see especially Goodwin, 1958:6). Most of our specimens were netted over streams or rivers bordered by dense vegetation. Two females collected in July and one taken in September had enlarged mammae and evidently had lactated recently. A September-taken male had testes that were 7 in length.

***Rhogeessa gracilis* Miller, 1897**

## Big-eared Yellow Bat

*Specimens examined* (3).—5 mi. NE Huejuquilla, 6200 ft., 1; 10 mi. SE Talpa de Allende, 5350 ft., 1; 17 km. SE Talpa de Allende, 5200 ft., 1.

Only six specimens of this rare bat are on record, of which three are from Jalisco. One of our specimens was reported previously by Jones (1964:514). A pregnant female (embryo 17 in crown-rump length) was netted 10 mi. SE Talpa



de Allende over a mountain stream in pine-oak forest on 15 May 1964 and a male from 17 km. SE Talpa de Allende (4 November 1962) was taken under similar circumstances at the Río Mascota. A second male was netted over an arroyo in an area of oak forest on 16 November 1966 at a place 5 mi. NE Huejuquilla, the northernmost locality from which the species has been recorded.

External and cranial measurements of our three specimens (males listed first), are, respectively: total length, 84, 89, 85; length of tail, 36, 43, 39; length of hind foot, 6, 8, 8; length of ear, 17.5, 18, 18; length of forearm, 33.3, 32.7, 33.5; greatest length of skull, 13.7, 13.7, 13.6; condylobasal length, 12.6, 12.5, 12.4; zygomatic breadth, 8.3, 8.4, 8.4; mastoid breadth, 7.1, 7.1, 7.2; breadth of braincase, 6.2, 6.1, 6.3; length of maxillary toothrow, 4.8, 4.8, 4.8; breadth across the upper molars, 5.2, 5.3, 5.3.

Brown *et al.* (1971) examined the baculum of an Jalisco specimen (KU108976) and found it resembled in gross morphology that of *Baeodon alleni*.

***Baeodon alleni*** (Thomas, 1892)

Allen's Baeodon

*Specimen examined* (1).—Piedra Gorda, 8 km. NW Soyatlán del Oro, 1 (TTU).

*Additional record*.—Santa Rosalía (the type locality).

This bat is known from but two record stations in Jalisco. We lack details of capture of the specimens reported from the state. External and cranial measurements of an adult female from northwest of Soyatlán del Oro (TTU 9306) are: total length, 91; length of tail, 41; length of hind foot, 9; length of ear, 16; length of forearm, 33.7; greatest length of skull, 15.2; condylobasal length, 14.0; zygomatic breadth, 9.5; interorbital constriction, 3.6; mastoid breadth, 7.9; breadth of braincase, 6.6; length of maxillary toothrow, 5.4; breadth across upper molars, 6.3. The specimen weighed 8.0 (8 April 1964).

***Plecotus townsendii australis*** Handley, 1955

Western Big-eared Bat

*Specimens examined* (2).—El Salto, 24 mi. W Guadalajara, 4500 ft., 2.

*Additional records* (Handley, 1959:189, unless otherwise noted).—San Andres, 10 mi. W Magdalena; San Pedro, Guadalajara; Cueva de las Garrochas, 17 km. NNW Soyatlán del Oro (Villa-R., 1967:430).

Our two specimens were netted on 17 September 1965 over a stream (see account of *Chiroderma salvini*); both were nonreproductive females. *P. townsendii* has been recorded only from the central part of Jalisco, but the species probably is widely distributed in the north and east as well (see Handley, 1959:188, fig. 24). We have not examined the single specimen reported from near Soyatlán del Oro by Villa-R. (1967:430) and it is provisionally listed here.

***Plecotus mexicanus*** G. M. Allen, 1916

Mexican Big-eared Bat

*Specimens examined* (11).—4½ mi. NE Comanja de Corona, 8000 ft., 1; 15 mi. S, 9 mi. E Talpa de Allende, 6900 ft., 3; 7 mi. S Tapalpa, 6800 ft., 2; 12 mi. S Tolimán, 7700 ft., 5.



TABLE 2.—Selected measurements of two species of *Plecotus* from Jalisco.

| Catalogue<br>number and<br>sex       | Length of<br>forearm | Greatest length<br>of skull | Zygomatic<br>breadth | Mastoid<br>breadth | Interorbital<br>constriction | Length of max-<br>illary toothrow | Breadth across<br>upper molars |
|--------------------------------------|----------------------|-----------------------------|----------------------|--------------------|------------------------------|-----------------------------------|--------------------------------|
| <i>Plecotus townsendii australis</i> |                      |                             |                      |                    |                              |                                   |                                |
| KU 103681,♀                          | 42.0                 | 16.7                        | 8.9                  | 9.5                | 3.7                          | 5.2                               | 6.0                            |
| KU 103682,♀                          | —                    | 16.6                        | 8.8                  | 9.2                | —                            | 5.3                               | 6.0                            |
| <i>Plecotus mexicanus</i>            |                      |                             |                      |                    |                              |                                   |                                |
| KU 98739,♀                           | 41.5                 | 15.7                        | 8.2                  | 8.8                | 3.3                          | 4.7                               | 5.5                            |
| KU 98740,♀                           | 42.8                 | 15.6                        | 8.4                  | 8.8                | 3.3                          | 4.9                               | 6.0                            |
| KU 98741,♀                           | 41.9                 | 15.7                        | 8.4                  | 9.0                | 3.3                          | 4.7                               | 5.8                            |
| KU 108978,♀                          | 42.2                 | 15.5                        | 8.2                  | 9.0                | 3.3                          | 4.6                               | 5.6                            |
| KU 108979,♀                          | 41.5                 | 15.6                        | 8.3                  | 9.0                | 3.5                          | 4.7                               | 5.7                            |

This big-eared bat, a highland species, has been taken in Jalisco at elevations from 6800 to 8000 feet. Our specimens constitute the first records for the state. Near Comanja de Corona, in far eastern Jalisco, a female was taken from an old mine shaft in oak forest. In mountainous areas in the western part of the state, individuals have been collected as follows: netted over a small stream; taken from an old mine shaft in pine-oak forest along with *Desmodus rotundus*; and shot in a cave in an area forested with alder along with some oak and pine. Four nonpregnant females obtained in a mine on 1 September 1966 were sluggish but not torpid. Three pregnant females collected south of Tolimán on 14 April 1967 each carried a single embryo (15, 17, and 18 in crown-rump length); two males from the same locality each had testes that measured 5.

Our specimens are easily identifiable as *P. mexicanus* based on Handley's (1959:137) key to species of the subgenus *Corynorhinus*. Selected measurements are given in Table 2.

***Plecotus phyllotis* (G. M. Allen, 1916)**  
Allen's Big-eared Bat

*Specimens examined* (3).—Volcán de Fuego, 9800 ft., 2; 5 mi. W Atenquique, 7700 ft., 1.

This bat is known from Jalisco by only three specimens from the two localities listed above, which are the southwesternmost known for the species and the highest in elevation (Genoways and Jones, 1967).

***Antrozous pallidus pallidus* (Le Conte, 1856)**  
Pallid Bat

*Specimens examined* (3).—12 mi. W Encarnación de Díaz, 5600 ft., 2; 1½ mi. WNW Amatitán, 4100 ft., 1.

*Additional record*.—Sta. Cruz del Valle, Guadalajara (J. A. Allen, 1890:176, and Van Gelder, 1959:10).

The pallid bat is known from Jalisco only from three widely scattered localities. It seems to prefer dry, open, upland areas where there is a year-round source of water.

The male from 1½ mi. WNW Amatitán was captured in a mist net set beneath a wild fig tree. The surrounding vegetation was mostly corn and mescal. Two females from 12 mi. W Encarnación de Díaz were netted by hand after being dislodged from their daytime retreat in the adobe walls of an abandoned building.

#### Family MOLOSSIDAE—Free-tailed Bats

##### ***Molossops greenhalli mexicanus* Jones and Genoways, 1967**

##### Greenhall's Free-tailed Bat

*Specimens examined* (5).—7½ mi. SE Tecamate, 1500 ft., 5.

This subspecies, first described in 1967 from Jalisco, now is known southward into Central America. Our five specimens, all adults (two males, three non-reproductive females), were netted over a stream lined by "dense, tall tropical deciduous forest" (Jones and Genoways, 1967:209) on 6 to 8 December, 1966. Seven other species of bats, including *Molossus molossus aztecus*, were taken in the same nets.

##### ***Tadarida brasiliensis mexicana* (Saussure, 1860)**

##### Mexican Free-tailed Bat

*Specimens examined* (229).—La Punta, 2 (ENCB); 12 mi. W Encarnación de Díaz, 5600 ft., 21; 14 mi. SE Lagos de Moreno, 6700 ft., 79; 2 mi. NW Magdalena, 4500 ft., 1; Teuchitlán, 22; Fabrica de Atemajac, 2 mi. N Guadalajara, 21; 2 1/10 mi. SW Guadalajara, 5200 ft., 2; Fabrica de Río Grande, 11½ mi. S, 10½ mi. E Guadalajara, 38; 13 mi. S, 15 mi. W Guadalajara, 16; 21 mi. SW Guadalajara, 5100 ft., 2; Ameca, 4000 ft., 3; 1 mi. SW Ameca, 4000 ft., 1; Hda. de Huascato, 1 (UNAM); 8 mi. NE Ocotlán, 5100 ft., 18; 5 km. W Jamay, 1 (ENCB); 5 mi. S Grullo, 3100 ft., 1.

*Additional records*.—Barranca del Gavilán, 9.7 km. W Etzatlán (Villa-R., 1967:442); Guadalajara (Elliot, 1907:524); Las Canoas (J. A. Allen, 1906:260); Ameca (Shamel, 1931:5); 10 km. NW Soyatlán del Oro (Villa-R., 1956:544).

The majority of the sites from which the Mexican free-tailed bat has been reported in Jalisco are located in the arid, eastern part of the state. Only at the locality near Grullo is subtropical habitat in evidence. The large series from near Lagos de Moreno was netted in a storehouse, apparently a night roost, of the Hda. Jaramillo, located in pine-oak forest; two *Myotis velifer* and a *Choeronycteris mexicana* were captured at the same time. Twenty-one *T. brasiliensis* from 12 mi. W Encarnación de Díaz were driven from the walls of an old adobe building with smoke, along with individuals of *M. velifer* and *Antrozous pallidus*.

Villa-R. and Cockrum (1962:50) reported a free-tailed bat that had been banded at Carlsbad Cavern, New Mexico, and later found alive in Cueva de las Garrochas, 10 km. NW Soyatlán del Oro. Constantine (1967:18) visited this same cave on 19 November 1957: "mummified and fleshed carcasses of Mexican free-tailed bats and cave myotis were found with about 35 live vampires. Included



in the free-tailed bat remains were newborn bats, identifying this cave as a breeding site." We have no records of maternity colonies of *T. brasiliensis* in Jalisco and suspect that most or all pregnant females migrate northward in spring. The remains of "newborn bats" reported by Constantine possibly were those of large embryos. In the months of June through September, our collections contain but three specimens from Jalisco, all males. Females (number in parenthesis) are represented by individuals from the following months: January (16), February (11), March (14), May (one), October (37). None of the females evinced reproductive activity.

***Tadarida femorosacca* (Merriam, 1889)**

Pocketed Free-tailed Bat

*Specimen examined* (1).—14 mi. NW Mascota, 6500 ft., 1.

*Additional record*.—Zacoalco (Alvarez and Aviña, 1964:246).

This free-tailed species presently is known from the southwestern United States southward in western México to Jalisco. Our specimen, a female preserved in spirits, was shot on 28 February 1967 as it foraged with other bats in pine-oak forest. No gross reproductive activity was evident.

***Eumops underwoodi underwoodi* Goodwin, 1940**

Underwood's Mastiff Bat

*Specimens examined* (9).—3 km. NE Talpa de Allende, 4900 ft., 8; 9 mi. NW Cuautla, 5900 ft., 1.

*Additional record*.—Juntas del Salitre, 6 km. N Soyatlán del Oro (Mitchell, 1965:100).

All specimens in our collection were taken in pine-oak forest at elevations from 4900 to 5900 feet. A female from 9 mi. NW Cuautla was netted as described in the account of *Promops centralis*. The series of eight specimens from northeast of Talpa de Allende was salvaged from among 13 badly mutilated by a native hunter, who found them roosting in a large hollow tree on 21 October 1962. Four of the eight were nonpregnant, adult females; three other females had poorly fused phalangeal epiphyses and lacked prominent mammae, indicative of young of the year. The one male, an adult, had testes that measured 11 in length.

External measurements of an adult male, followed by the mean (and extremes) of those for four adult females, are: total length, 155, 158.5 (150-162); length of tail, 49, 50.2 (48-52); length of hind foot, 19, 17.7 (17-18); length of ear, 31.5, 32.2 (32-33); length of forearm, 70.0, 70.9 (69.4-72.3); weight, 66.5, 65.6 (63.9-66.7). Cranial measurements of the male and three females are, respectively: condylobasal length, 28.1, 27.4, 27.6, 27.4; zygomatic breadth, 18.4, 17.9, 17.9, 18.0; postorbital constriction, 5.8, 5.7, 5.8, 6.0; rostral breadth, 10.5, 10.0, 10.3, 10.0; length of maxillary toothrow, 11.8, 11.5, 11.5, 11.6.

***Promops centralis centralis* Thomas, 1915**

Thomas' Mastiff Bat

*Specimen examined* (1).—9 mi. NW Cuautla, 5900 ft., 1.

*Additional record*.—Tenamastlán (Alvarez and Aviña, 1964:249).

Goodwin (1946:338) first listed *P. centralis* from Jalisco but gave no specific locality. Later, Alvarez and Aviña (1964:249) reported three individuals from Tenamastlán. Our one specimen, a male, was netted on 25 March 1965 over a creek in pine-oak forest along with a single *Eumops underwoodi*.

We follow Ojasti and Linares (1971) in regarding *P. centralis* as a polytypic species.

### ***Molossus ater nigricans* Miller, 1902**

#### **Black Mastiff Bat**

*Specimens examined* (26).—El Zapote, 1 (UNAM); Tenamastlán, 2 (UNAM); 5 mi. S Grullo, 3100 ft., 1; Cuitzamala, 25 ft., 1; 2 mi. N Tenacatita, 25 ft., 13; Cihuatlán, 15 ft., 8.

*Additional records*.—Teuchitlán (Miller, 1902:396); Los Masos (J. A. Allen, 1906:260).

Most of the 26 specimens of this mastiff bat examined from Jalisco originated in the tropical lowlands of the extreme southwestern part of the state. Field notes that accompany these specimens suggest that *M. ater* often forages over large rivers, the eight from Cihuatlán, for example, having been shot in flight by P. L. Clifton on the evening of 2 December 1966 over Río Cihuatlán. Bats taken in association with *M. ater* at the place 2 mi. N Tenacatita are listed in the account of *Saccopteryx bilineata*.

### ***Molossus sinaloae sinaloae* J. A. Allen, 1906**

#### **Allen's Mastiff Bat**

*Specimens examined* (23).—Teuchitlán, 4; 6 mi. E Limón, 2700 ft., 8; 5 mi. S Grullo, 3100 ft., 11.

The 23 specimens listed above evidently provide the first records of this bat from Jalisco. No gross reproductive activity was noted among 16 females from the months of February (three), September (six), and October (seven). At collecting sites labeled with reference to both El Limón and Grullo, individuals were netted over tree-lined streams.

### ***Molossus molossus aztecus* Saussure, 1860**

#### **Little Mastiff Bat**

*Specimens examined* (76).—2 mi. S La Cuesta, 1500 ft., 8; 5 mi. S Grullo, 3100 ft., 2; Contla, 1320 m., 32; 7½ mi. SE Tecomate, 1500 ft., 29; 10 mi. NNE Pihuamo, 3500 ft., 5.

*Additional records* (Gardner, 1966:5).—Peña Colorado, Río de Talpa, ca. 10 km. N Talpa de Allende; Rancho de los Ocotes, ca. 6 km. N Talpa de Allende; Río de Talpa, Talpa de Allende; Los Masos.

This small mastiff bat has been taken in ecological situations ranging from dense, tall, tropical deciduous forest (7½ mi. SE Tecomate) to heavily cultivated, semiarid parts of the interior (Contla). Jones and Genoways (1967:209) gave details of the collecting site southeast of Tecomate in the original description of *Molossops greenhalli mexicanus*. Measurements of Jaliscan specimens recently have been published by Jones *et al.* (1971:24).

On 7 August 1969, at Contla, a group of small boys led one of us (Watkins) and Elmer C. Birney to an old adobe church near the edge of town and some 100



yards distant from a stream. Between an archway support and the wall, we captured 32 *M. molossus*, all females save for one male. Twenty-seven of the females were pregnant, each carrying a single embryo that averaged 25.5 (17.0-28.3) in crown-rump length. It is of note that although four mist nets had been placed over the nearby river the previous night, no molossids were captured there.

### ZOOGEOGRAPHY OF JALISCAN BATS

The known chiropteran fauna of Jalisco consists of the following numbers of species by family: two Emballonuridae; one Noctilionidae; four Mormoopidae; 24 Phyllostomatidae; one Natalidae; 22 Vespertilionidae; and eight Molossidae. All of these, with the exception of some vespertilionids, are Neotropical in their affinities.

Among the emballonurid, noctilionid, and mormoopid species that occur in Jalisco only one, *Saccopteryx bilineata*, reaches the northern limit of its geographic distribution in western México in the state. The remaining six species range to the north of Jalisco, several occurring as far north as Sonora. Only four phyllostomatid bats reach northern distributional limits in Jalisco — *Micronycteris megalotis*, *Hylonycteris underwoodi*, *Carollia subrufa*, and *Enchisthenes hartii* — a relatively low number considering that 11 of 19 phyllostomatids known from Sinaloa reach northern distributional limits there (Jones *et al.*, 1972:25). The one natalid, *Natalus stramineus*, is a Neotropical species that is widespread in western México, reaching its northern distributional limits in Baja California and Sonora.

The 22 species of vespertilionids present an array of zoogeographic affinities. Eleven species (*Myotis yumanensis*, *M. velifer*, *M. auriculus*, *M. thysanodes*, *M. volans*, *M. californicus*, *Pipistrellus hesperus*, *Plecotus townsendii*, *P. mexicanus*, *P. phyllotis*, and *Antrozous pallidus*) have temperate affinities, eight species (*Myotis fortidens*, *M. nigricans*, *Eptesicus fernalis*, *Lasiurus intermedius*, *Lasiurus ega*, *Rhogeessa parvula*, *R. gracilis*, and *Baeodon alleni*) are primarily Neotropical in distribution, whereas the remaining three species (*Eptesicus fuscus*, *Lasiurus borealis*, and *Lasiurus cinereus*) are widespread in distribution. Of the 11 species with temperate affinities, five (*Myotis auriculus*, *M. volans*, *M. californicus*, *Plecotus phyllotis*, and *Antrozous pallidus*) reach in Jalisco the southern limit of their geographic range in western México. Three vespertilionids (*Eptesicus fernalis*, *Baeodon alleni*, and *Rhogeessa gracilis*) that are primarily Neotropical in distribution are not known from north of Jalisco.

Although all New World molossids are Neotropical in affinity, one species, *Tadarida brasiliensis*, has an extensive distribution in temperate areas as a warm-season migrant. Two kinds (*Molossops greenhalli* and *Promops centralis*) reach the known northern limit of their geographic distribution in Jalisco. *Tadarida femorosacca* ranges as far north as southern California, but evidently occurs no farther south along the west coast of México than southern Jalisco. Of the remaining four species occurring in the state, one, *Eumops underwoodi*, occurs north to southern Arizona, whereas the other three (*Molossus ater*, *M. sinaloae*, and *M.*

TABLE 3.—Known distribution of the 62 species of Jaliscoan bats by physiographic region. The Pacific Region is split into coastal and montane segments at 2500 feet elevation. The number following the name of the physiographic unit indicates the total number of collecting sites within that unit.

| Species                         | Pacific Region |              | Interior Basins (48) | Canyon Region (15) | Eastern Highlands (7) |
|---------------------------------|----------------|--------------|----------------------|--------------------|-----------------------|
|                                 | Coastal (39)   | Montane (73) |                      |                    |                       |
| <i>Saccopteryx bilineata</i>    | +              |              |                      |                    |                       |
| <i>Balantiopteryx plicata</i>   | +              | +            | +                    | +                  |                       |
| <i>Noctilio leporinus</i>       | +              |              |                      |                    |                       |
| <i>Pteronotus personatus</i>    | +              | +            |                      |                    |                       |
| <i>Pteronotus parnellii</i>     | +              | +            | +                    | +                  |                       |
| <i>Pteronotus davyi</i>         | +              | +            | +                    | +                  |                       |
| <i>Mormoops megalophylla</i>    | +              | +            | +                    | +                  |                       |
| <i>Micronycteris megalotis</i>  | +              | +            |                      |                    |                       |
| <i>Micronycteris sylvestris</i> |                | +            |                      |                    |                       |
| <i>Macrotus waterhousii</i>     | +              | +            | +                    | +                  | +                     |
| <i>Glossophaga soricina</i>     | +              | +            | +                    | +                  |                       |
| <i>Glossophaga commissarisi</i> | +              | +            |                      |                    |                       |
| <i>Anoura geoffroyi</i>         | +              | +            | +                    |                    |                       |
| <i>Choeronycteris mexicana</i>  | +              | +            | +                    | +                  | +                     |
| <i>Choeroniscus godmani</i>     | +              |              |                      |                    |                       |
| <i>Hylonycteris underwoodi</i>  |                | +            |                      |                    |                       |
| <i>Leptonycteris nivalis</i>    |                | +            |                      |                    |                       |
| <i>Leptonycteris sanborni</i>   | +              | +            | +                    | +                  |                       |
| <i>Carollia subrufa</i>         | +              |              |                      |                    |                       |
| <i>Sturnira lilium</i>          | +              | +            | +                    | +                  |                       |
| <i>Sturnira ludovici</i>        | +              | +            |                      |                    |                       |
| <i>Chiroderma salvini</i>       | +              | +            | +                    | +                  |                       |
| <i>Artibeus hirsutus</i>        |                | +            | +                    | +                  |                       |
| <i>Artibeus jamaicensis</i>     | +              | +            | +                    | +                  |                       |
| <i>Artibeus lituratus</i>       | +              | +            | +                    | +                  |                       |
| <i>Artibeus aztecus</i>         |                | +            |                      |                    |                       |
| <i>Artibeus toltecus</i>        | +              | +            | +                    | +                  |                       |
| <i>Artibeus plaeotis</i>        | +              | +            |                      |                    |                       |
| <i>Enchisthenes hartii</i>      |                | +            |                      |                    |                       |
| <i>Centurio senex</i>           | +              | +            |                      |                    |                       |
| <i>Desmodus rotundus</i>        | +              | +            | +                    | +                  |                       |
| <i>Natalus stramineus</i>       | +              | +            |                      |                    |                       |
| <i>Myotis yumanensis</i>        | +              |              | +                    |                    | +                     |
| <i>Myotis velifer</i>           |                | +            | +                    | +                  | +                     |
| <i>Myotis fortidens</i>         | +              |              |                      |                    |                       |
| <i>Myotis auriculus</i>         |                | +            |                      |                    |                       |
| <i>Myotis thysanodes</i>        |                | +            |                      |                    |                       |
| <i>Myotis volans</i>            |                | +            |                      |                    |                       |
| <i>Myotis californicus</i>      |                | +            | +                    |                    |                       |
| <i>Myotis nigricans</i>         | +              | +            |                      |                    |                       |
| <i>Pipistrellus hesperus</i>    |                | +            | +                    | +                  |                       |
| <i>Eptesicus fuscus</i>         |                | +            | +                    |                    | +                     |
| <i>Eptesicus furinalis</i>      | +              | +            |                      |                    |                       |
| <i>Lasiurus borealis</i>        | +              | +            | +                    | +                  |                       |
| <i>Lasiurus cinereus</i>        |                | +            |                      | +                  |                       |
| <i>Lasiurus intermedius</i>     |                | +            |                      |                    |                       |



TABLE 3.—Continued.

|                              |   |   |   |   |   |
|------------------------------|---|---|---|---|---|
| <i>Lasiurus ega</i>          | + | + | + |   |   |
| <i>Rhogeessa parvula</i>     | + | + | + |   |   |
| <i>Rhogeessa gracilis</i>    |   | + |   | + |   |
| <i>Baeodon alleni</i>        |   | + |   |   |   |
| <i>Plecotus townsendii</i>   |   | + | + |   |   |
| <i>Plecotus mexicanus</i>    |   | + |   |   | + |
| <i>Plecotus phyllotis</i>    |   | + |   |   |   |
| <i>Antrozous pallidus</i>    |   |   | + | + | + |
| <i>Molossops greenhalli</i>  | + |   |   |   |   |
| <i>Tadarida brasiliensis</i> |   | + | + | + | + |
| <i>Tadarida femorosacca</i>  |   | + | + |   |   |
| <i>Eumops underwoodi</i>     |   | + |   |   |   |
| <i>Promops centralis</i>     |   | + |   |   |   |
| <i>Molossus ater</i>         | + | + | + |   |   |
| <i>Molossus sinaloae</i>     |   | + | + |   |   |
| <i>Molossus molossus</i>     | + | + |   |   |   |

*molossus*) all reach northern distributional limits in Sinaloa (Jones *et al.*, 1972:24).

The distribution of Jaliscan bats by physiographic region (see section on physiography that precedes the species accounts) is given in Table 3. We have split the Pacific Region into a coastal segment (for localities of less than 2500 feet in elevation) and a montane segment. The total number of species presently known from each unit is as follows: Pacific montane, 54; Pacific coastal, 36; Interior Basins, 30; Canyon Region, 22; Eastern Highlands, eight. The bat fauna of the montane segment of the Pacific Region is diverse, lacking only eight species that occur in the state. Of these eight (*Saccopteryx bilineata*, *Noctilio leporinus*, *Choeroniscus godmani*, *Carollia subrufa*, *Myotis fortidens*, *M. yumanensis*, *Antrozous pallidus*, and *Molossops greenhalli*), six are confined to the Pacific coastal segment in Jalisco; *Myotis yumanensis* occurs in the Pacific coastal area as well as in the Interior Basins and Eastern Highlands regions, whereas *Antrozous pallidus* is recorded from the latter two regions and the Canyon Region. *Antrozous pallidus* is the only bat occurring in the state that has not been taken in one of the two segments of the Pacific Region. Twelve species are known to occur in Jalisco only in the Pacific montane area. No species is restricted to any one of the other regions (Interior Basins, Canyon Region, Eastern Highlands).

The three interior regions have fewer species than the two Pacific segments, primarily because of the progressive loss of species with Neotropical affinities. The reason is directly related to climatic differences between regions and the resultant effect on vegetation. Only eight species are presently known from the Eastern Highlands (Mexican Plateau) of the northeastern part of the state. Although eight may be slightly lower than the actual number of species, it does not appear to be a gross underestimate of the number present. Of the eight species, seven are basically insectivorous; the exception is *Choeronycteris mexicana*, which feeds on pollen of plants growing in arid regions (Alvarez and González

Quintero, 1970). Frugivorous bats would not be expected to be abundant in an area such as the Eastern Highlands because of the general lack of suitable fruit-bearing trees excepting possibly along some of the major watercourses. The chiropteran fauna of the Eastern Highlands is unique within the state in that species with temperate affinities (*Myotis yumanensis*, *M. velifer*, *Plecotus mexicanus*, and *Antrozous pallidus*) outnumber those with tropical affinities (*Macrotus waterhousii*, *Choeronycteris mexicana*, and *Tadarida brasiliensis*); one species, *Eptesicus fuscus*, has a widespread distribution (but it may also be considered as basically having temperate affinities). In all other parts of the state, species with Neotropical affinities far outnumber those classified as temperate and widespread.

A total of 10 species, all with Neotropical affinities, presently is known to reach northern distributional limits in Jalisco (see earlier discussion). Of these, only one, *Rhogeessa gracilis*, is known to occur in Jalisco outside of Pacific coastal and montane areas (in the Canyon Region). Three species (*Myotis auriculus*, *M. volans*, and *Plecotus phyllotis*) that reach southern distributional limits in Jalisco are known to occur in the state only in the montane segment of the Pacific Region; two other bats, *M. californicus* and *T. femorosacca* that reach southern limits in the state also occur in the Pacific montane segment. *Myotis californicus* and *T. femorosacca*, along with *Antrozous pallidus*, occur in the Interior Basins, with the latter also having been taken in the Canyon and Eastern Highland regions. Based upon these admittedly incomplete data, the diverse chiropteran fauna of the montane segment of the Pacific Region appears to result from overlapping and intermixing of Neotropical and temperate components.

The mammalian fauna of Jalisco was considered as transitional between Nearctic to the Neotropical faunas by Hershkovitz (1958), whereas Baker (1967) included mammals of coastal Jalisco in his North Subtropical Sector of the Neotropical Division. The chiropteran fauna of Jalisco tends to support both of these arrangements. The Pacific coastal fauna is composed almost entirely of species with Neotropical affinities (*M. yumanensis* and *L. borealis* being the only exceptions). However, as pointed out above, in inland parts of the state, species with Nearctic affinities are widespread and outnumber Neotropical species on the Mexican Plateau. The Sierra Madre del Sur probably represents the main area of transition in the state, with Neotropical species being dominant to the west of these mountains and with Nearctic species more numerous to the east and north.

#### GAZETTEER OF LOCALITIES IN JALISCO

The following is a list of place-names in Jalisco used in recording the localities from which bats have been taken. Each place-name is followed by its location in degrees and minutes of latitude and longitude. An asterisk following the coordinates indicates that they were taken from some source other than Gazetteer 15 (México) of the United States Board on Geographic Names. Parenthetical numbers following localities identify them on the accompanying map (Fig. 3).



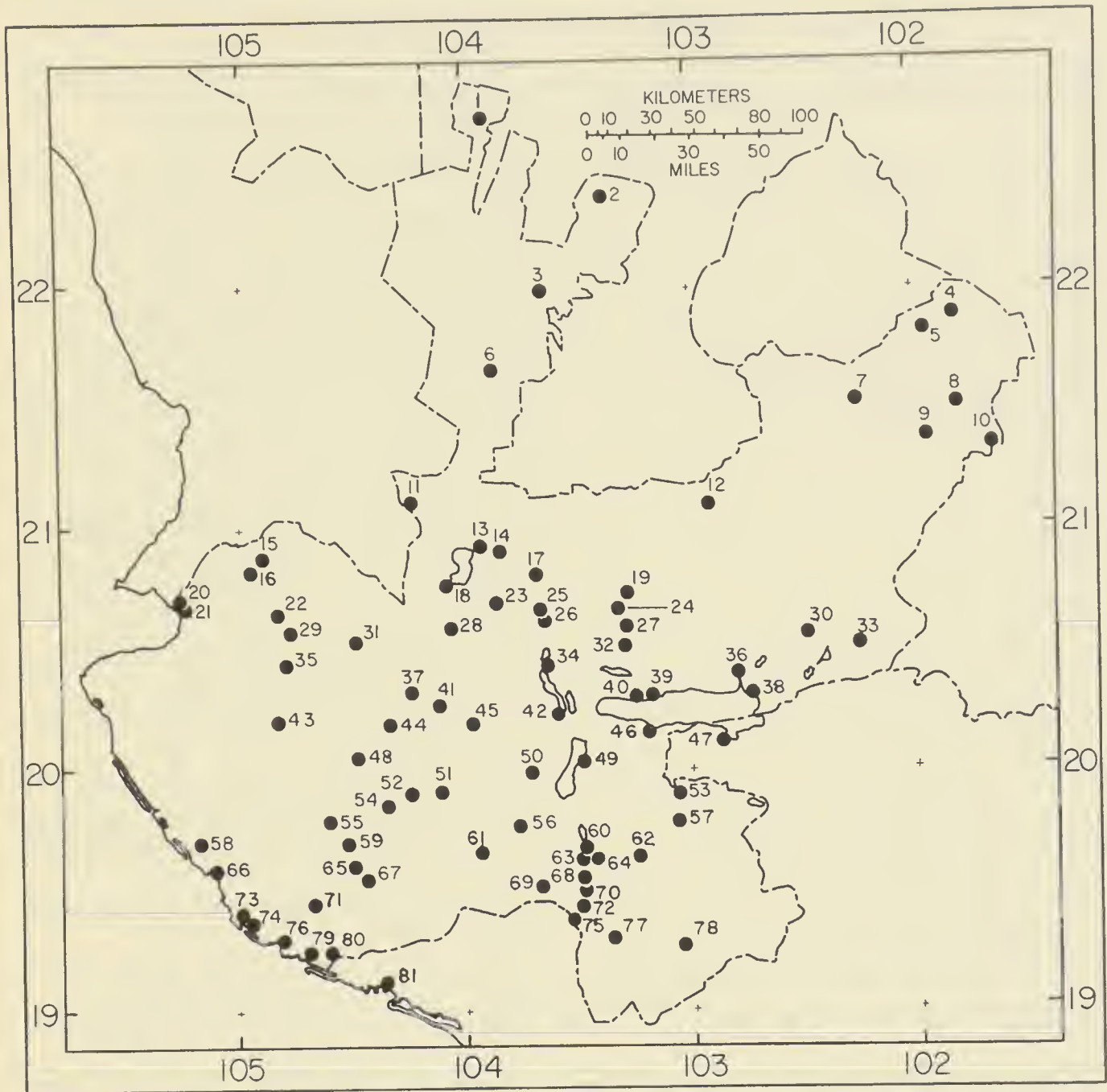


FIG. 3.—Location of place-names in Jalisco associated with bats taken in the state. Numbers adjacent to symbols identify the locality in the accompanying gazetteer.

Ajijic —  $20^{\circ} 18' N, 103^{\circ} 17' W$ (40).  
 Amatitán —  $20^{\circ} 50' N, 103^{\circ} 43' W$ (17).  
 Ameca —  $20^{\circ} 33' N, 104^{\circ} 02' W$ (28).  
 Arado (El) —  $19^{\circ} 40' N, 104^{\circ} 31' W^*$ (59).  
 Atemajac de Brizuela —  $20^{\circ} 11' N, 103^{\circ} 42' W$ (45).  
 Atenguillo —  $20^{\circ} 25' N, 104^{\circ} 31' W$ (31).  
 Atenquique (Artenkiki) —  $19^{\circ} 31' N, 103^{\circ} 30' W$ (68).  
 Atotonilco el Alto —  $20^{\circ} 33' N, 102^{\circ} 31' W$ (30).  
 Atoyac (Atayac) —  $20^{\circ} 02' N, 103^{\circ} 35' W$ (49).  
 Autlán de la Grana—see Autlán (de Navarro).  
 Autlán (de Navarro) —  $19^{\circ} 46' N, 104^{\circ} 22' W$ (54).

Barranca Ibarra —  $20^{\circ} 47' N, 103^{\circ} 21' W^*$ (19).  
 Barro de Navidad (Navidad, La Barra de Navidad) —  $19^{\circ} 12' N, 104^{\circ} 41' W$ (79).  
 Bahía Chamela —  $19^{\circ} 33' N, 105^{\circ} 07' W$ (66).  
 Bolaños —  $21^{\circ} 41' N, 103^{\circ} 47' W$ (6).  
 Chapala —  $20^{\circ} 18' N, 103^{\circ} 12' W$ (39).  
 Chinampas —  $21^{\circ} 50' N, 101^{\circ} 48' W$ (4).  
 Cihuatlán —  $19^{\circ} 14' N, 104^{\circ} 35' W$ (80).  
 Ciudad Guzmán (Zapotlán) —  $19^{\circ} 41' N, 103^{\circ} 29' W$ (60).  
 Cojumatlán —  $20^{\circ} 07' N, 102^{\circ} 50' W$  (Michoacán) (47).  
 Comanja de Corona —  $21^{\circ} 19' N, 101^{\circ} 42' W$ (10).  
 Contla —  $19^{\circ} 45' N, 103^{\circ} 05' W$ (57).

- Cuarenta —  $21^{\circ} 30' \text{ N}$ ,  $101^{\circ} 46' \text{ W}$ (8).  
 Cuautla —  $20^{\circ} 11' \text{ N}$ ,  $104^{\circ} 21' \text{ W}$ (44).  
 Cuitzamala (Cuitzmala) —  $19^{\circ} 23' \text{ N}$ ,  $104^{\circ} 59' \text{ W}$ (73).  
 Durazno — not exactly located; but approximately  $19^{\circ} 32' \text{ N}$ ,  $104^{\circ} 16' \text{ W}$ \*(67).  
 El Salto — about 24 mi. W Guadalajara at approximately  $20^{\circ} 39' \text{ N}$ ,  $103^{\circ} 44' \text{ W}$ \*(25).  
 El Tabaco —  $19^{\circ} 40' \text{ N}$ ,  $105^{\circ} 10' \text{ W}$ (58).  
 El Zapote —  $20^{\circ} 31' \text{ N}$ ,  $103^{\circ} 18' \text{ W}$ (32).  
 Emiliano Zapata — approximately  $19^{\circ} 21' \text{ N}$ ,  $104^{\circ} 58' \text{ W}$ \*(74).  
 Encarnación de Díaz —  $21^{\circ} 31' \text{ N}$ ,  $102^{\circ} 14' \text{ W}$ (7).  
 Etzatlán (Itzatlán) —  $20^{\circ} 46' \text{ N}$ ,  $104^{\circ} 05' \text{ W}$ (18).  
 Grullo (El Grullo) —  $19^{\circ} 48' \text{ N}$ ,  $104^{\circ} 13' \text{ W}$ (52).  
 Guadalajara —  $20^{\circ} 40' \text{ N}$ ,  $103^{\circ} 20' \text{ W}$ (24).  
 Huascato (also Hacienda de Huascato) —  $20^{\circ} 32' \text{ N}$ ,  $102^{\circ} 14' \text{ W}$ (33).  
 Huejuquilla (el Alto) —  $22^{\circ} 36' \text{ N}$ ,  $103^{\circ} 52' \text{ W}$ (1).  
 Itzatlán — see Etzatlán.  
 Ixtapa —  $20^{\circ} 42' \text{ N}$ ,  $105^{\circ} 15' \text{ W}$ (20).  
 Jamay —  $20^{\circ} 18' \text{ N}$ ,  $102^{\circ} 43' \text{ W}$ (38).  
 Jilotlán de los Dolores —  $19^{\circ} 12' \text{ N}$ ,  $103^{\circ} 13' \text{ W}$ (78).  
 La Cuesta —  $20^{\circ} 10' \text{ N}$ ,  $104^{\circ} 51' \text{ W}$ (43).  
 La Cumbre de Autlán — 9 mi. SSW Autlán (approximately  $19^{\circ} 42' \text{ N}$ ,  $104^{\circ} 22' \text{ W}$ ).  
 La Huerta —  $19^{\circ} 28' \text{ N}$ ,  $104^{\circ} 39' \text{ W}$ (71).  
 Lagos de Moreno —  $21^{\circ} 21' \text{ N}$ ,  $101^{\circ} 55' \text{ W}$ (9).  
 La Laguna, Sierra de Juanacatlán —  $20^{\circ} 39' \text{ N}$ ,  $104^{\circ} 47' \text{ W}$ (22).  
 La Mesa María de León — approximately  $22^{\circ} 25' \text{ N}$ ,  $103^{\circ} 24' \text{ W}$ \*(2).  
 La Punta —  $21^{\circ} 49' \text{ N}$ ,  $101^{\circ} 57' \text{ W}$ (5).  
 Lake Chapala — approximately  $20^{\circ} 15' \text{ N}$ ,  $103^{\circ} 00' \text{ W}$ .  
 Las Canoas —  $19^{\circ} 37' \text{ N}$ ,  $103^{\circ} 32' \text{ W}$ (63).  
 Las Peñas — see Puerto Vallarta.  
 Limón (El) —  $19^{\circ} 52' \text{ N}$ ,  $104^{\circ} 07' \text{ W}$ (51).  
 Los Masos —  $19^{\circ} 31' \text{ N}$ ,  $103^{\circ} 41' \text{ W}$ \*(69).  
 Magdalena —  $20^{\circ} 55' \text{ N}$ ,  $103^{\circ} 57' \text{ W}$ (13).  
 Mascota —  $20^{\circ} 32' \text{ N}$ ,  $104^{\circ} 49' \text{ W}$ (29).  
 Mazamitla —  $19^{\circ} 55' \text{ N}$ ,  $103^{\circ} 02' \text{ W}$ (53).  
 Milpillas —  $20^{\circ} 44' \text{ N}$ ,  $104^{\circ} 56' \text{ W}$ (16).  
 Ocotlán —  $20^{\circ} 21' \text{ N}$ ,  $102^{\circ} 46' \text{ W}$ (36).  
 Pihuamo (Piguamo) —  $19^{\circ} 15' \text{ N}$ ,  $103^{\circ} 23' \text{ W}$ (77).  
 Plan de Barrancas —  $21^{\circ} 02' \text{ N}$ ,  $104^{\circ} 11' \text{ W}$ (11).  
 Platanar (Plantinar) —  $19^{\circ} 28' \text{ N}$ ,  $103^{\circ} 27' \text{ W}$ (70).  
 Puerto Vallarta —  $20^{\circ} 37' \text{ N}$ ,  $105^{\circ} 15' \text{ W}$ (21).  
 Purificación —  $19^{\circ} 43' \text{ N}$ ,  $104^{\circ} 38' \text{ W}$ (55).  
 San Luis Soyatlán —  $20^{\circ} 12' \text{ N}$ ,  $103^{\circ} 18' \text{ W}$ (46).  
 San Marcos —  $19^{\circ} 25' \text{ N}$ ,  $103^{\circ} 28' \text{ W}$ (72).  
 San Pedro —  $20^{\circ} 37' \text{ N}$ ,  $103^{\circ} 18' \text{ W}$ \*(27).  
 San Sebastián —  $20^{\circ} 47' \text{ N}$ ,  $104^{\circ} 51' \text{ W}$ (15).  
 Santa Ana Acatlán — not located on available maps; possibly the Acatlán at  $20^{\circ} 26' \text{ N}$ ,  $103^{\circ} 38' \text{ W}$ .  
 Santa Cruz del Valle — see Guadalajara.  
 Santa Rosalía —  $20^{\circ} 01' \text{ N}$ ,  $104^{\circ} 33' \text{ W}$ (48).  
 Santiago —  $19^{\circ} 07' \text{ N}$ ,  $104^{\circ} 21' \text{ W}$  (Colima) (81).  
 Sierra de Cuale —  $20^{\circ} 20' \text{ N}$ ,  $105^{\circ} 00' \text{ W}$ .  
 Sierra Nevado de Colima (Volcán de Nieve) —  $19^{\circ} 33' \text{ N}$ ,  $103^{\circ} 38' \text{ W}$ .  
 Soyatlán (Soyatlán del Oro) —  $20^{\circ} 20' \text{ N}$ ,  $104^{\circ} 15' \text{ W}$ \*(37).  
 Tala (Tola) —  $20^{\circ} 40' \text{ N}$ ,  $103^{\circ} 42' \text{ W}$ (26).  
 Talpa de Allende (frequently simply Talpa on specimen labels) —  $20^{\circ} 23' \text{ N}$ ,  $104^{\circ} 51' \text{ W}$ (35).  
 Tamazula (de Goriano) —  $19^{\circ} 38' \text{ N}$ ,  $103^{\circ} 15' \text{ W}$ (62).  
 Tapalpa —  $19^{\circ} 57' \text{ N}$ ,  $103^{\circ} 46' \text{ W}$ (50).  
 Tecomate —  $19^{\circ} 35' \text{ N}$ ,  $104^{\circ} 28' \text{ W}$ (65).  
 Tenacatita —  $19^{\circ} 17' \text{ N}$ ,  $104^{\circ} 47' \text{ W}$ (76).  
 Tenamastlán (Tenamaxtlán) —  $20^{\circ} 13' \text{ N}$ ,  $104^{\circ} 10' \text{ W}$ (41).  
 Tequila —  $20^{\circ} 54' \text{ N}$ ,  $103^{\circ} 47' \text{ W}$ (14).  
 Teuchitlán —  $20^{\circ} 41' \text{ N}$ ,  $103^{\circ} 52' \text{ W}$ (23).  
 Tolimán —  $19^{\circ} 36' \text{ N}$ ,  $103^{\circ} 55' \text{ W}$ (61).  
 Tonila —  $19^{\circ} 26' \text{ N}$ ,  $103^{\circ} 31' \text{ W}$ (75).  
 Tuxpan —  $19^{\circ} 33' \text{ N}$ ,  $103^{\circ} 24' \text{ W}$ (64).  
 Venustiano Carranza (San Gabriel) —  $19^{\circ} 44' \text{ N}$ ,  $103^{\circ} 47' \text{ W}$ (56).  
 Villa Corona —  $20^{\circ} 25' \text{ N}$ ,  $103^{\circ} 41' \text{ W}$ (34).  
 Villa Guerrero —  $21^{\circ} 59' \text{ N}$ ,  $103^{\circ} 36' \text{ W}$ (3).  
 Volcán de Colima (Volcán de Fuego) —  $19^{\circ} 33' \text{ N}$ ,  $103^{\circ} 38' \text{ W}$ .  
 Yahualica —  $21^{\circ} 08' \text{ N}$ ,  $102^{\circ} 51' \text{ W}$ (12).  
 Zacoalco (de Torres) —  $20^{\circ} 14' \text{ N}$ ,  $103^{\circ} 35' \text{ W}$ (42).  
 Zapotlán — see Ciudad Guzmán.  
 Zavala — not located on available maps.



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